REINVENTING THE TIME OF THE PAST: RHYTHMIC VOICING AND METRICAL ALLUSION IN THE MUSIC OF GEORGE BENJAMIN AND THOMAS ADÈS

by

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B.A., Carleton College, 2008

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(Music Theory)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

July 2010

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Abstract

This study proposes a method for analyzing rhythm in relation to conventional meter. The concept of rhythmic voicing informs a basic analytical strategy that is flexible enough to represent different forms of rhythmic organization and to accommodate various theoretical perspectives. The theoretical perspective developed here employs cognitive schemata to construct a model of how listeners interpret rhythmic patterns in terms of conventional meter, even when the rhythms do not fully conform to the characteristics of this meter. Rhythms that invoke but deviate from meter are understood as metrical allusions according to the categories of simple allusion, disjunction, and distortion. Metaphorically applied image schemata further interpret the changes in metrical allusions during a piece, contributing to the comprehension of form and meaning. The method is applied in analyses of works by two contemporary British composers: Sudden Time and Three Inventions for Chamber Orchestra by George Benjamin, and Asyla and Piano Quintet by Thomas Adès.
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Acknowledgments

Many thanks are due to John Roeder for his guidance during this project and throughout my master’s degree. I could not have asked for a more knowledgeable, supportive, and generous advisor. I would also like to thank Richard Kurth for his helpful and insightful feedback.

I am grateful to Faber Music Limited and Boosey & Hawkes, Inc., for granting permission to reprint excerpts from the following works:

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**Introduction**

In recent decades, many composers in the Western art-music tradition have drawn upon musical features characteristic of earlier stylistic periods. Contemporary rhythmic organization often recalls types of regular, familiar patterns, like the $\frac{3}{4}$ meter of a waltz, that modernists working in the middle decades of the twentieth century had avoided. Of course, even in a work that suggests the metrical character of an eighteenth-century dance, current metrical usage differs greatly from that of other eras. Through the analysis of rhythm in pieces by two contemporary British composers, George Benjamin and Thomas Adès, this study examines ways of referring to and extending past metrical conventions.

Like much art music, works by Benjamin and Adès exhibit variability in their rhythmic regularity and synchronization, such that rhythms that occur at different times within a single piece might relate to conventional meter in different ways. Theories of meter exist to describe each such mode of rhythmic organization, but few offer a framework that accommodates changes among highly dissimilar forms of periodicity. To address this problem, Chapter 1 introduces the concept of rhythmic voicing, which provides a means for analyzing rhythms that exhibit changing regularity and synchronization. Based on Roeder’s (1994) method of pulse-stream analysis, an analysis of rhythmic voicing divides rhythmic content into a texture of multiple voices. These rhythmic voices are understood as theoretical constructs analogous to the pitch-oriented voices that music theorists traditionally invoke when discussing voice leading in counterpoint and part-writing. Constraints on the establishment and behavior of rhythmic
voices are sufficiently flexible to allow for a conceptual and analytical unity that matches the fluidity of changes among rhythmic states in the music under consideration.

Rhythmic voicing constitutes an open-ended framework for analysis in which one of many possible theoretical perspectives may guide analytical decisions. In the case of the present analyses, an approach informed by theories of listener cognition supports interpretation of connections with conventional meter. Chapter 1 thus redefines four previously theorized types of rhythmic organization according to principles of rhythmic voicing intended to reflect perceptual processes. In this conception, rhythmic voices are determined primarily by patterns of accentuation, but grouping also plays a role. Conventional meter displays optimal regularity and synchronization in the form of mostly isochronous and hierarchically coordinated voices, whereas the three other types of rhythmic organization feature limited asynchrony in an otherwise conventional rhythmic texture (metrical dissonance), much greater asynchrony among voices that are still mostly isochronous (rhythmic polyphony), and entirely variable regularity and synchronization of voices (fragmentary meter).

As explained in Chapter 2, a cognitive schema is a simple, learned pattern that operates in the process of cognition to help a listener make sense of musical stimuli. Schemata for meter allow listeners to recognize how rhythms that do not possess the characteristics of conventional meter established in Chapter 1 nonetheless allude to meter. Depending on the relationships among rhythmic voices, three types of metrical allusion are possible: simple allusion, disjunction, and distortion. In addition to schemata that are specific to musical experience, schemata acquired through other domains of experience can also be applied metaphorically to music. Such metaphorical schemata
may underlie the interpretation of changing metrical allusions over the course of a piece and how these changes contribute to an understanding of musical form and meaning. In this regard, the present study focuses on the metaphor of tension and relaxation.

Chapters 3 and 4 use the concepts of rhythmic voicing and schema theory in analyzing excerpts from Benjamin’s *Sudden Time* and *Three Inventions for Chamber Orchestra* and from several pieces by Adès, including *Asyla* and the *Piano Quintet*. Most of these excerpts allude to common-practice meter by activating a basic musical schema for triple meter. Such allusion is a defining feature of the main theme in *Sudden Time*, and it is linked to the work’s titular metaphor of the absence and presence of time. In the second of the *Three Inventions*, the rhythmic voices that establish an initial, strong allusion to triple meter gradually diverge. These changes in the relationships among rhythmic voices articulate the main sections of the piece and create a pattern of increasing tension followed by sudden relaxation upon the voices’ elegant return to a recognizable triple-meter pattern.

Adès’s music frequently incorporates references to other styles, genres, and works, and ostinatos that suggest the tango genre in two different pieces illustrate how metrical allusion can participate in such musical references. In contrast, metrical allusions in the second movement of *Asyla* are not related as directly to the work’s musical references as the tango ostinatos. In the example from *Asyla*, Adès distorts an underlying triple meter through differing, written-out rubato and acceleration in each of the loosely coordinated rhythmic voices, and the unusual time signatures of the *Piano Quintet* expand on this type of rhythmically complex allusion. The *Quintet’s* thematic structure clearly evokes traditional sonata form, and rhythmic variation of the second
theme in its appearances throughout the piece deepens this connection by varying the proximity to meter in a pattern of tension that resembles the tonally driven dramatic plan of a typical sonata.
Chapter 1: Rhythmic Voicing

1.1 Models of Meter

Recent theories of meter offer descriptions of several types of rhythmic periodicity, including conventional meter, metrical dissonance, rhythmic polyphony, and fragmentary meter. These four types can be distinguished in terms of the regularity and synchronization of their components. Following London (2004, 4), I define a rhythm as a series of durations, in which each duration is determined by the time interval from the onset of one event to the onset of the next event. Regularity refers to the amount of repetition that a rhythm displays. In a single, continuous rhythm, the greatest possible regularity results from constant repetition of the same duration between the onsets of successive events; such a rhythm is said to be isochronous. Synchronization describes the extent to which the onsets in multiple concurrent rhythms coincide, and high synchronization obtains when several rhythms are coordinated in a system that minimizes non-coincident onsets. Although other means of achieving high synchronization might be possible, several theorists model such coordination in terms of a hierarchy of concurrent rhythms.

Meter will be defined very broadly as the periodic organization of musical time, which may depend more or less directly on particular rhythms. Conventional meter exhibits high degrees of both regularity and synchronization. According to the theory introduced by Lerdahl and Jackendoff (1983, 17-20) and extended by Temperley (2001) and London (2004), the meter that occurs in much homophonic music of the common-practice era consists of a pattern of durationless time points called beats occurring in multiple, hierarchically organized levels. Unlike rhythms, the levels of beats need not be
literally present as onsets in the music; rather, an experienced listener infers beat levels that conform to a grammatical rule structure (Lerdahl and Jackendoff 1983, 17-8).

Lerdahl and Jackendoff’s (1983, 69) rules for “metrical well-formedness,” such as the requirement for all levels to be isochronous and for every beat on a given level to coincide with a beat on a faster level, ensure that each level is perfectly regular and almost completely synchronized with the other concurrent levels. Although different characterizations of conventional meter have been proposed (e.g., in Hasty 1997), definitions of conventional meter throughout the present study are based on the work of Lerdahl and Jackendoff (1983) and their followers.

Metrical dissonance refers to rhythmic asynchrony that occurs in a context that otherwise resembles the organization of conventional meter. Drawing on earlier work by Yeston (1976), Krebs (1999, 23) considers meter to consist of multiple layers of pulses. Similar to Lerdahl and Jackendoff’s (1983) levels of beats, Krebs’s (1999, 23) pulse layers are isochronous and coordinated, with each slower layer acting to “interpret” the pulses in a faster layer “by organizing its pulses into larger units.” In contrast to abstract beats, however, each pulse corresponds to a specific musical event. Additionally, the fact that interpretive layers do not necessarily relate to one another hierarchically permits asynchronies among layers that Krebs (1999, 23, 31-4) classifies into the categories of displacement dissonance, such as syncopation, and grouping dissonance, such as hemiola. Krebs’s (1999) work and Cohn’s (2001) related ski-hill graph technique for mapping levels of grouping and hemiola in metrical space are most commonly applied to describe meter in nineteenth-century music by composers including Schumann and Brahms.
Roeder (1994) also employs pulses determined by the onsets of musical events in analyzing *rhythmic polyphony* in Schoenberg’s music. Rhythmic polyphony displays local regularity that is comparable to the regularity in a pulse-based conception of conventional meter or metrical dissonance, because every accented event initiates a duration in at least one isochronous *pulse stream* (Roeder 1994, 234). A given pulse stream might only be present briefly, so on the scale of an entire work rhythmic polyphony is usually less regular than the other two types, in which several levels or layers persist for extended periods. Accordingly, pulse-stream theory is less concerned with the qualities of static relationships among concurrent streams than with how changing ensembles of pulse streams, and their relation to recurring musical materials, create form (Roeder 1994, 235). Furthermore, since rhythmic polyphony follows no requirements for hierarchy, concurrent pulse streams may be entirely independent of one another, allowing for minimal synchronization (Roeder 1994, 234). Although such rhythmic organization clearly differs substantially from conventional meter, Roeder’s (1994) theory is still metrical in the sense that it addresses the basic rhythmic periodicity of isochrony.

Finally, Hasty’s (1997) perspective differs from the previous three in that he does not posit isochronous beats or pulses. Instead, Hasty (1997, 84) interprets the metrical quality of rhythmic events using the principle of *projection*, according to which two successive beginnings create a projective potential that is realized if the next beginning arrives after the same duration that separated them. Among the significant analytical contributions of Hasty’s (1997, 257-81) theory is the capacity for describing shifting metrical implications in the music of twentieth-century composers such as Webern and
Babbitt. Since projective analysis responds primarily to regularity achieved through the immediate replication of duration, it supports subtle distinctions among metrical sensations even when periodicity can only be heard in very short, disconnected, and ambiguous time spans; we might call this very irregular rhythmic state \textit{fragmentary meter}.\footnote{Hasty (1997, 280, 257) refers to such music as “projectively fragmented” and as consisting of “small, fragmentary gestures.”}

Unlike the other approaches considered here, Hasty’s (1997) theory is intended to address all possible metrical phenomena, and as such it provides a potentially suitable method for analyzing the changing types of rhythmic relationships with which the present study is concerned. Rather than employing Hasty’s (1997) technique of projective analysis, however, I propose rhythmic voicing as an alternative approach that ties together features of Lerdahl and Jackendoff’s (1983), Krebs’s (1999), and Roeder’s (1994) models. One of Hasty’s (1997) goals in developing his philosophically informed conception of meter is to avoid the Cartesian atemporalization that Lerdahl and Jackendoff’s (1983, 20) “metrical grid” implicitly encourages, and my approach is not entirely immune to such criticism. Nonetheless, an understanding in terms of voices seems better suited than a projective method to portraying continuity of metrical patterns over time and polyphonic relationships among simultaneous rhythms.

\section*{1.2 Definition of Rhythmic Voicing}

The basic premise of this analytical strategy is that the rhythmic and metrical content of any musical passage can be understood as a combination and elaboration of multiple hypothetical rhythms called \textit{rhythmic voices}. A rhythmic voice consists of a series of durations that form a single, continuous component of the rhythmic activity in a
given passage. The beginning of each duration in a rhythmic voice corresponds to an actual or expected onset in the music, and a duration lasts until the onset that begins the next duration in the same voice. All durations are represented analytically using note values rather than rests, even if some durations in a rhythmic voice do not correspond to a sounding event in the music under analysis. Although rhythmic voices have a close connection to rhythms in the music, the durations and onsets in rhythmic voices are not identical to those in the music because, like any analytical representation, rhythmic voices are mental constructs. Thus, rhythmic voices may omit some musical onsets if doing so does not detract from an effective explanation of the work, and they may add onsets that are not literally present by a specific means such as the inferred accents explained below.

The term “voice” is intended as an analogy with the familiar theoretical construct involved in voice leading: if a traditional musical voice links a succession of pitch events based on contrapuntal criteria such as stepwise motion, register, and harmonic intervals in relation to other voices, a rhythmic voice similarly links a succession of musical events according to rhythmic and metrical criteria. Like pitch voices, different rhythmic voices do not necessarily correspond to separate parts in the music. A single rhythmic voice can be doubled in multiple parts, a rhythmic voice can be transferred from one part to another, and a single part can imply multiple rhythmic voices. The rhythmic voices present in a particular passage are referred to collectively as the *rhythmic texture*, again by analogy with pitch terminology.

The criteria for identifying rhythmic voices in a collection of musical events depend on the music under consideration and the preferences of the analyst. For instance,
rhythmic voices might be taken to represent rhythmic constituents of a work’s compositional design, in which case analytical decisions for separating musical events into voices would be based on information from sources such as score notation, sketch studies, and a known or conjectural compositional system. The long-range polyrhythms that Link (1994) identifies in the music of Elliott Carter could be cast as such compositional rhythmic voices, for although Link (1994) cites numerous ways in which they contribute to audible features of the music, the polyrhythms clearly arise through Carter’s compositional practice.

Alternatively, rhythmic voices might be determined according to principles of how the music is likely to be heard. In spite of their differences, all four theories discussed above are listener oriented inasmuch as they are informed by ideas about listener perception, and the present study also focuses primarily on listening. In this formulation, the onsets and durations in rhythmic voices derive from activity in the two related rhythmic dimensions of grouping and accentuation. Both grouping and accentuation exhaustively partition a span of musical time into shorter durations, but each accomplishes this division by different means: whereas grouping establishes durations by linking musical events on the basis of Gestalt principles of perceived proximity and similarity, an accent is a moment of emphasis caused by some kind of perceptually salient change, with an accentual duration emerging as the time between two accents (Lerdahl and Jackendoff 1983, 40-2, 17; Benjamin 1984, 368-9).

The two modes of rhythmic organization are conceptually complementary, in the sense that grouping forms durational groups by associating musical events and consequently differentiates these groups at the durationless boundaries between them,
while accentuation creates durationless moments of accent by differentiating musical events and consequently associates the durational spans between these accents. We normally do not encounter the simplest possible manifestation of this complementarity, because rarely, if ever, do all the accents in a piece occur at the same moments as the boundaries between groups; instead, the two partitionings often create overlapping durations (Benjamin 1984, 369). Nonetheless, accentuation and grouping are mutually related, as accents and grouping boundaries depend on characteristics of many of the same musical parameters, including duration, register, dynamics, and articulation (Lerdahl and Jackendoff 1983, 46, 84). Benjamin (1984, 369) demonstrates this interrelationship with regard to the durations between onsets, pointing out that, all else being equal, a note that is longer than the notes that immediately precede and follow it will produce an agogic accent at its onset, creating an accentual duration that continues into the following notes. Yet this same relatively long note will also group with the preceding notes, causing a grouping boundary at the onset of the next note. Figure 1, after Benjamin’s (1984, 369) Figure 7, provides a simple illustration of such codependent accentual and grouping durations. Benjamin (1984, 370-1) goes on to observe that, although conventional meter may align with periodic patterns in either component, it seems to be more closely tied to accentuation. Other models of rhythmic organization also concentrate on accentuation; for example, Krebs’s (1999, 23) and Roeder’s (1994, 234-5) pulses likewise derive primarily from accentuation. Thus, while grouping is an essential part of the rhythmic experience of music and certainly contributes to analytical decisions, accentuation usually provides the direct basis for determining onsets in rhythmic voicing.
Figure 1. Overlapping durational partitioning by grouping and accentuation, after Benjamin's (1984, 369) Figure 7.
Common types of accentuation include agogic accent, changes of harmony, and high points in melodic contour, dynamics, or textural density, but the exact definitions and relative strengths of these and other kinds of accent depend on the particular features of the style, piece, and passage in question. In addition, expectations about the regularity and synchronization of the patterns that rhythmic voices model affect this negotiation among accents and especially how the accented events contribute to durations in multiple voices. The limitations on regularity and synchronization that Lerdahl and Jackendoff’s (1983), Krebs’s (1999), and Roeder’s (1994) analytical methods impose reflect the characteristics of the respective styles that they address, but these limitations also prevent each method from accommodating substantial changes in regularity and synchronization. As conceived here, the regularity and synchronization of rhythmic voices may conform to such limitations when appropriate, but the voices are not required to fit any one mode of organization—in principle, there are no absolute restrictions on the regularity and synchronization of voices as long as the determination of voices is analytically justified. This flexibility allows for conceptual and analytical unification of the types of meter that the above approaches treat separately. To elucidate the technique of identifying rhythmic voices, I will redefine the four types of periodicity introduced in section 1.1 in terms of rhythmic voices, considering conventional meter in the most detail.

1.3 Conventional Meter in Terms of Rhythmic Voices

I redefine conventional meter as the phenomenon of periodic rhythmic organization that can be represented with multiple, coordinated rhythmic voices in a texture demonstrating optimal regularity and synchronization. The durationless beats in Lerdahl and Jackendoff’s (1983) levels are thus translated into the onsets of durations in
rhythmic voices, and as in beat levels, the regularity and synchronization of rhythmic voices in conventional meter manifest in the isochrony of individual voices and hierarchy among voices. Specifically, the rhythmic texture contains two or more continuous, isochronous voices, all of which belong to a single, unambiguous hierarchical structure.\(^2\) The hierarchy takes the following form: Let \(x\) be any isochronous voice made up of durations that are longer than the durations in at least one other isochronous voice in the texture, and let \(y\) be the voice with the longest durations among those isochronous voices in the texture with durations shorter than the durations in \(x\).\(^3\) Then there exists conventional meter if, for every such rhythmic voice \(x\), (1) all onsets in \(x\) coincide with onsets in \(y\), and (2) all successive onsets in \(x\) are separated by either one or two successive onsets in \(y\) (cf. Lerdahl and Jackendoff 1983, 69, MWFRs 2 and 3; Temperley 2001, 37, MWFRs 1 and 2).

Note that condition (1) excludes metrical dissonance from conventional meter, in spite of the fact that phenomena such as syncopation and hemiola occur throughout common-practice music. Such apparent inverisimilitude underscores the simplified, idealized sense of my usage of the term “conventional.” However, if a determination of rhythmic voicing represents only rhythmic patterns that persist for some period of time (e.g., several notated bars), momentary metrical dissonance could still occur in conventional meter so defined.

\(^2\) Although this definition requires all isochronous voices in the texture to be part of the hierarchy, it does not exclude the possibility of additional, non-isochronous voices, as described below.

\(^3\) For instance, in a set of three isochronous voices moving in quarter notes, half notes, and whole notes, there are two possible \(x/y\) pairings. If the voice with whole-note durations is \(x\), then the voice with half note durations is \(y\), and if the voice with half-note durations is \(x\), the voice with quarter-note durations is \(y\).
A central feature of Lerdahl and Jackendoff’s (1983, 19) metrical hierarchy is the differentiation of beat strength: the more levels to which a beat belongs, the stronger it is. Similarly, the greater the number of simultaneous onsets in the rhythmic texture at a given moment, the stronger the accent of the musical event at that moment. This property reflects an experienced listener’s characteristic understanding of conventional meter as a cycle of numbered beat classes (Benjamin 1984, 375) by modeling a rhythmic period that attributes the same accentual strength to equivalent onsets (e.g., all instances of beat class 1). In terms of rhythmic voicing, the number of beat classes in a given conventional meter is expressed by the relationship between a particular pair of isochronous voices. The faster of these two voices is the tactus, the most perceptually salient voice in the rhythmic texture; this salience depends on several aspects of how the texture is realized, especially tempo (Lerdahl and Jackendoff 1983, 21; London 2004, 31-3). The slower voice in this pair, the measure, is the isochronous voice that most clearly organizes the tactus onsets into longer durations. All moments when onsets in the tactus and measure coincide belong to beat class 1, also called the downbeat. Beat class 1 has greater accentual strength than any other beat class, and if there are more than two total beat classes, the remaining beat classes may or may not be equal in accentual strength.4

In many cases, the number of beat classes matches the typical interpretation of the notated time signature; for instance, at a moderate tempo, music notated in 4/4 or 12/8 normally has four beat classes. However, when defined perceptually, as here, the measure and tactus sometimes differ from the periodicity that time signatures and

4 This definition of “beat class” differs somewhat from the more common use of the term, as in Cohn (1992, 149), where beat classes are numbered from 0, do not necessarily correspond to the tactus, and are subject to set-theoretical manipulation.
barlines suggest. In a passage notated in $\frac{3}{4}$ and played at a fast tempo, for example, the dotted-half-note durations of the notated bar might be heard to belong to the tactus voice, and each duration in the concurrent measure voice might last for bars, resulting in a perceived compound duple meter instead of the simple triple meter usually associated with a time signature of $\frac{3}{4}$ (see the discussion of Example 1 below).

The measure and tactus may be an $x/y$ pair as defined above, but there may also be one or two isochronous voices in the texture with durations less than those of the measure and greater than those of the tactus. Thus, by condition (2), the measure may delineate durations of 2, 3, 4, 6, 8, 9, 12, 18, or 27 tactus onsets; however, the vast majority of meters have 2, 3, or 4 beat classes. Perceived meters with 6, 8, 9, or 12 beat classes are still possible, either matching the notated meter (as in some instances of $\frac{6}{4}$ or $\frac{9}{4}$) or departing from it (as in a slow $\frac{4}{4}$ with an eighth-note tactus and a whole-note measure). I know of no examples of meters that can be heard to have 18 or 27 beat classes, so although these types are theoretically permissible in my formulation, it might be the case that a meter with more than 12 beat classes cannot be perceived under normal circumstances because it would involve too many categorically distinct elements occurring over too long a period of time.

Two concerns arise in connection with the differentiation of accentual strength in terms of beat classes. First, judging the relative strength of accents is no simple matter, especially when comparing different types of accent such as agogic accent and changes

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5 Caplin (1998, 35) identifies the same phenomenon in distinguishing between real and notated measures. In the present text, notated measures are referred to as bars to avoid confusion with the rhythmic voice called the measure.
As a general tendency, greater accentual strength is associated with a greater number of types of accent and greater magnitude of a single type of accent (e.g., a dynamic accent marked $f$ instead of $mf$), but unclear and exceptional cases abound. In addition, accentual strength in almost any realization of a conventional meter sometimes deviates from the regular pattern of beat classes, with two instances of the same beat class displaying accents of decidedly different strengths, or stronger accents occurring in between beat-class onsets. Some such deviations may be regarded as the momentary metrical dissonances mentioned above, but as Benjamin (1984, 363-8) shows, the unequal strength and non-isochronous timing of accents even in a typical theme by Mozart are not so superficial.

These two complications of accentual strength relate to the broader quality of the rhythms in any music as a complex collection of information susceptible to numerous fruitful and often mutually contradictory interpretations. There are thus multiple possible rhythmic voicings for any passage, depending in part on decisions about relative accentual strength and the significance of irregular accents. An interpretation intended to demonstrate that a particular excerpt possesses the characteristics of conventional meter as it has been understood by Lerdahl and Jackendoff (1983) will privilege periodic uniformity in evaluating accentual strength, showing isochronous, hierarchical voices at the expense of underrepresenting some contradictory information. In line with such privileging, an onset that is missing from a pattern of isochrony or accentual strength may be supplied as the result of inferred accent when the context of the pattern is sufficiently

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6 Several authors, including Tenney and Polansky (1980) and Roeder (1995), offer methods of quantifying accentual strength to allow for precise comparison, but similar calculations will not be attempted here.
clear. As Chapter 2 explains, the preference for interpreting a rhythmic texture in relation to conventional meter is consistent with a schematic view of listener cognition. Furthermore, since the conditions for conventional meter are not general requirements for the activity of rhythmic voices, the rhythmic voices in an analysis that seeks to represent conventional meter are free to depart from isochrony and hierarchy if the music changes to a different type of rhythmic organization.

Although the translation of beat levels into rhythmic voices preserves much of Lerdahl and Jackendoff’s (1983) model, an important difference in the rhythmic voicing of conventional meter is the possibility of non-isochronous voices. The rhythmic-voicing definition of hierarchy in conventional meter given above applies only to the isochronous voices in a texture. While by definition a rhythmic texture in conventional meter must contain at least two isochronous, hierarchical voices, it may also contain one or more non-isochronous voices that meet the following conditions: (1) the non-isochronous voice is an ostinato, meaning that it repeats a single series of durations without interruption; (2) the onsets that begin all repetitions of the ostinato’s durational series coincide with every onset in one isochronous voice in the texture; and (3) all onsets in the ostinato coincide with onsets in one or more isochronous voices in the texture.


Like all of the restrictions on voices defined in this section, these limitations for non-isochronous voices apply only in conventional meter; under other circumstances, non-isochronous voices are not required to be ostinatos. In addition, a different kind of non-isochrony involving a switch in the duration of an otherwise isochronous rhythmic voice can also occur in conventional meter, as discussed in section 1.4.

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8 The beginning of an ostinato rhythm is dictated by features of its musical realization, and is not inherent in the rhythm of the non-isochronous voice.

9 Like all of the restrictions on voices defined in this section, these limitations for non-isochronous voices apply only in conventional meter; under other circumstances, non-isochronous voices are not required to be ostinatos. In addition, a different kind of non-isochrony involving a switch in the duration of an otherwise isochronous rhythmic voice can also occur in conventional meter, as discussed in section 1.4.
Figure 2. Non-isochronous voices in conventional meter.

a. Possible

b. Not possible

c. Not possible
Figure 2 illustrates these conditions. Figure 2a shows a conventional meter with four isochronous rhythmic voices (1, 2, 3, and 4) and one non-isochronous voice (3a). In this context, voice 3a is a possible non-isochronous voice because it conforms to an ostinato; the onsets of the dotted quarter notes, which begin the period of the ostinato, coincide with all the onsets in voice 5; and all of the onsets in voice 3a coincide with onsets in either voice 1 or voice 2. In Figure 2b, voice 3b is an ostinato, but it is not a possible non-isochronous voice because the half-note onsets that begin its period do not all coincide with the onsets in one other voice in the texture. Since voice 3b has a period of a dotted half note, the onsets of its half notes would have to be coordinated with an isochronous dotted-half-note voice, but adding such a voice would violate the conditions for hierarchy. Finally, voice 3c in Figure 2c meets conditions (1) and (2) of the requirements for non-isochronous voices. However, the onsets of its triplet half notes do not coincide with onsets in any voice, so voice 3c also is not possible.

In conventional meter as defined here, non-isochronous voices provide additional, more specific information about rhythmic periodicity. Besides the information in the rhythm of the ostinato itself, a non-isochronous voice often increases the distinctions among beat classes by further differentiating their accentual strength. For instance, hierarchical isochronous voices cannot show a difference between the accentual strength of the second and third beat classes in a triple meter. In a rhythmic texture with a quarter-note tactus and a dotted-half-note measure, though, a non-isochronous voice with a half-note onset on beat class 1 and a quarter-note onset on beat class 3 indicates that beat class 1 has the greatest accentual strength (three coincident rhythmic voice onsets), beat class 2 has the least accentual strength (one onset), and beat class 3 has intermediate
strength (two onsets), as in a triple meter with well-articulated anacruses to the downbeat. Alternatively, a non-isochronous voice with a quarter-note onset on beat class 1 and a half-note onset on beat class 2 indicates that the second beat class has greater accentual strength than the third beat class, as in many seventeenth- and eighteenth-century sarabandes (Hudson and Little 2001, 274-5).

Example 1 uses rhythmic voices to represent the conventional meter in a simple melody. Different types of accent allow us to distinguish in this single part the four coordinated rhythmic voices notated below the staff, and the rows of phrase markings above the staff use Lerdahl and Jackendoff’s (1983) notation to indicate grouping. As in Figure 1, the group-based durational partitioning in the passage is consistently offset by one quarter note from the accentual partitioning of the rhythmic voices, with the dotted-half-note duration of each of the shortest groups beginning one quarter note before the corresponding accentual duration in rhythmic voice 3.

The most basic accent in Example 1 is simply a note onset, and the prevalence of onsets at durational intervals of a quarter note, including an uninterrupted series of quarter notes in bars 3 through 6, establishes the isochronous quarter notes of voice 1. If the example is played at a relatively slow tempo, voice 1 will likely be heard as the tactus. Although the melody does not articulate the second quarter note in bars 1 to 2 and 7 to 8, these onsets still appear in voice 1 as the result of inferred accents; here and in other examples, durations in rhythmic voices that correspond to inferred accents are enclosed in parentheses. Such an inference is particularly appropriate in the analysis of a

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10 Like accentuation and rhythmic voicing, multiple interpretations of grouping are possible; Example 1 shows the most regular of several alternative groupings of the melody.
Example 1. Rhythmic voicing implied by a melody in conventional meter.
single line, where, just as in a compound melody of multiple pitched voices, the explicit articulation and differentiation of all components of the implied voices often is not possible or desirable.

An explanation of the inferred accents in bars 7 and 8 seems straightforward: since there have been onsets every quarter note for the four preceding bars, a listener might well expect to hear the missing onsets that complete the isochronous pattern. The inferred accents in the first two bars of Example 1 are not as intuitive, though, because they occur before the isochronous series of onset accents. The proposed hearing of these first inferred accents relates to Fraisse’s (1963) conception of the *psychological present*. Based on a survey of empirical research, Fraisse (1963, 84-5, 92-3) argues that we do not experience the present time as a durationless instant that proceeds at a constant rate as if along a number line, but rather in subjectively variable units 2 to 3 seconds in duration. This psychological present can contain up to about seven coherent events, and relationships among these events such as order are perceived directly, not by detecting each event separately and then comparing memories of the events (Fraisse 1963, 91, 87-8). According to this view of temporal perception, if the first three bars of Example 1 belong to the same unit in the psychological present, the onset accents in the first two bars could be heard in the context of the isochronous onsets in bar 3, and the missing accents could be inferred even though they complete a pattern that only becomes apparent after their occurrence. The continuation of the pattern in the next unit of experienced time, as well as the learned expectations for conventional meter discussed in Chapter 2, would reinforce this inference. Accents can thus be inferred in continuation of
a pattern that is clearly presented within a short period of time either before or after the moment of the inference.

In non-isochronous voice 2, quarter-note durations reflect the contour accents created by melodic peaks on the third quarter note of nearly every bar. Usually, these quarter notes are also harmonic dissonances, establishing an alternation between two successive quarter notes of consonance and one quarter note of dissonance that adds a mild accent of harmonic change on the downbeat of each bar. Since voice 2 reflects these two related factors, when the third quarter note of the bar lacks either a melodic peak or harmonic dissonance, the remaining type of accent is sufficient to preserve the ostinato. Thus, although the anacrusis to the first bar is not a melodic peak, it lends accent to the downbeat of the first bar by implying a different harmony than in the first bar. In bar 4, dissonance occurs on the second quarter note instead of the third, but the third quarter note is still a melodic peak, and in bar 7, the third quarter note is not a melodic peak, but the large leap from the half-note D5 gives the chordal skip to F#4 enough emphasis as a change of pitch to continue the voice, especially in light of the preceding pattern. A sense of closure produced by the return in bars 7 to 8 of the opening motion from F#4 to G4 could also add to the accentuation in voice 2 at the end of the melody.

Three different types of events contribute to the determination of onsets in voice 3, the measure voice. The half notes in bars 1 to 2 and 7 to 8 create agogic accents on the notated downbeats for the first and last two dotted-half-note durations in the voice. Interaction with grouping leads to the two measure onsets in bars 5 and 6 in connection with the principle of parallelism. One of the main interpretive strategies that guides
Lerdahl and Jackendoff’s (1983, 51-3) grouping decisions, parallelism denotes the tendency to interpret in the same way two or more ordered series of musical events that correspond to one another in the sense that the first event in series 1 maps onto the first event in series 2, the second event in series 1 maps onto the second event in series 2, et cetera. Group 3 consists of two smaller groups that are parallel because they have the same three-quarter-note rhythm and their pitch contours, \(<A4, G4, B4>\) and \(<C5, B4, D5>\), are related by diatonic transposition.\(^{11}\) Group 3 is also parallel to group 1, with each of the two groups in group 3 embellishing the half notes in the two components of group 1 by adding a skip up a third within the tonic harmony. The strong parallelism within and between groups 1 and 3 justifies an interpretation of onsets in voice 3 during group 3 that parallels voice 3’s onsets during group 1: even though bars 5 and 6 lack the agogic accents of bars 1 and 2, a listener will likely recognize the parallelism with group 1 and hear the same pattern of onsets in voice 3. Finally, the onsets in voice 3 in bars 3 and 4 result from accents inferred in the context of the preceding and following dotted-half-note isochrony. The two accents in voice 3 are inferred even though note onsets and changes from dissonance to consonance occur at these two moments, because these onset, contour, and harmonic-change accents already contribute to voices 1 and 2, and further differentiation of accentual strength is not literally present. Voice 3 omits the onset on the anacrusis to bar 1 for the same reason.

The regular alteration between implied tonic and dominant harmony for most of the melody constitutes a more substantial type of harmonic change than the dissonances

\(^{11}\) Of course, the determination of grouping is not based solely on parallelism. The regularity of the surrounding pattern of grouping accounts for why these are the two groups that make up group 3 instead of the alternative three-note parallel pairings in bars 4 to 6, \(<G4, A4, G4>\) and \(<B4, C5, B4>\) or \(<G4, B4, C5>\) and \(<B4, D5, E5>\).
and consonances relevant to voice 2, forming the accents that are the primary basis for onsets in voice 4. By omitting the final harmonic change on the downbeat of bar 8, this voice reveals more overtly than the rest of the texture the preference for isochrony in an analysis of conventional meter; the final harmonic change would likely be reflected in, for example, an analysis that placed greater weight on structural harmony than isochrony. In addition to harmonic change, the melodic parallelism between groups 1 and 3 reinforces voice 4, whereas the long durations possibly detract from its perceptual salience. At a rapid tempo, the shorter duration of the dotted whole note would render voice 4 more salient, to the point that the tactus and measure might be heard as voices 3 and 4, respectively, instead of voices 1 and 3, changing the number of beat classes from three to two. Of course, in any such instance of a rhythmic texture that accommodates alternative pairings of measure and tactus, the number of beat classes that a particular listener hears depends not only on musical characteristics such as tempo, but also on her or his own perceptual tendencies and analytical decisions.

The analysis of Example 1 demonstrates the types of accentual and grouping considerations that may be involved in determining rhythmic voicing in conventional meter. While it is certainly plausible for a listener to discern even the finer of the distinctions invoked in the preceding analysis, most performances of music in conventional meter differentiate the rhythmic voices more clearly than this analysis suggests because they involve *expressive variations*, intentional changes by performers to the explicitly notated musical content (Sloboda 1983, 379). As Sloboda (1983, 388) has shown, communicating conventional meter is among the functions for which performers use expressive variations, introducing accents, especially of articulation and dynamics,
systematically in accordance with time signatures and barlines. However, because expressive variation may differ among multiple performances of the same score, and because time signatures and barlines in music from periods other than the common-practice era do not necessarily connote the accentual patterns of conventional meter, my analyses of rhythmic voicing do not incorporate this additional information.

1.4 Metrical Dissonance, Rhythmic Polyphony, and Fragmentary Meter in Terms of Rhythmic Voicing

We now move from the rhythmic-voicing definition of conventional meter to the other three types of rhythmic organization discussed in section 1.1. The rhythmic voicing of music containing metrical dissonance closely resembles that of conventional meter. In fact, in a state of metrical dissonance, a set of coordinated voices is present that displays exactly the same regularity and synchronization as in conventional meter; these voices correspond to Krebs’s (1999, 23, 30) isochronous pulse layer and metrically consonant interpretive layers. In addition to the hierarchically coordinated voices, there is at least one other isochronous voice containing onsets that do not coincide with onsets in one or more of the faster voices in the hierarchical set.

Relationships among voices with non-coincident onsets in metrical dissonance fall into the two basic categories of irreducible tempo relationships and displacement relationships.12 In irreducible tempo relationships, “irreducible” refers to a property of

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12 These two categories modify the terminology and notation for Krebs’s (1999) grouping and displacement dissonance in several ways. First, although the analogy with harmonic dissonance is appealing, it does not seem appropriate in all situations, so the categories are renamed “relationships.” I retain “metrical dissonance” as a label for the type of rhythmic organization, however. Second, to avoid confusion with Lerdahl and Jackendoff’s (1983) terminology, “irreducible tempo relationships” replace “grouping relationships.” Finally, I change Krebs’s (1999) additive notation for displacement to
the ratio between the different durations in two isochronous voices: if the shorter duration \( n \) is an (integral) divisor of the longer duration \( m \), then the ratio \( \frac{m}{n} \) is reducible; otherwise, it is irreducible.\(^{13}\) The ratio of long to short durations in any pair of hierarchically coordinated voices is reducible, but non-coincident onsets that cannot all be incorporated into a single hierarchy obtain for irreducible ratios. A particular irreducible tempo relationship is notated as \( T_{\frac{x}{y}} \), where \( x \) and \( y \) are the lowest possible positive integers that represent the ratio of long to short durations between the two isochronous voices in question; \( \frac{x}{y} \) is thus always greater than 1. Without an additional relationship of displacement between the two voices, their onsets will coincide every \( x \) durations in the faster voice and every \( y \) durations in the slower voice. Figure 3a provides an example of a \( T_{\frac{3}{2}} \) relationship.

While irreducible tempo relationships describe non-hierarchical states between isochronous rhythmic voices with different durations, *displacement relationships* pertain to non-hierarchical pairs of voices with equal durations. Two isochronous voices with equal durations and coincident onsets cannot exist in the same texture because they would simply represent the same voice. If their onsets do not coincide, however, the voices stand in a displacement relationship notated as \( D_{\frac{p}{q}} \), where \( p \) is the shortest fractions in order to avoid assigning priority to particular voices. These means of describing relationships between pairs of voices apply to any type of rhythmic texture, not just metrical dissonance.

\(^{13}\) Although I define the comparison of the voices in terms of durations, we may think of the relationship in terms of tempo by metaphorically equating shorter durations in an isochronous voice with greater speed. I suggest this metaphor earlier in the chapter by referring to “faster” and “slower” voices.
Figure 3. Irreducible tempo relationships and displacement relationships.

a. $T^3_2$

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1  . . . . . . . .
2  . . . . . . . .
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b. $D^1_3$

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1  . . . . . . . .
2  . . . . . . . .
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c. $T^3_2$ and $D^1_{12}$

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1  . . . . . . . .
2  . . . . . . . .
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duration between non-coincident onsets, and \( q \) is the duration between successive onsets in a single voice. If necessary, the values of \( p \) and \( q \) are changed to the lowest possible positive integers, as in tempo relationships, so \( \frac{p}{q} \) is always greater than 0 and less than or equal to \( \frac{1}{2} \). Figure 3b shows a D\( \frac{1}{4} \) relationship.

Although the two voices in an irreducible tempo relationship each have different durations, they can be considered to display an additional relationship of displacement if their coincident onsets occur less frequently than the tempo relationship dictates. For example, the T\( \frac{3}{2} \) relationship in Figure 3a does not have a displacement relationship, because coincident onsets could not occur any more frequently than every dotted whole note. The voices in Figure 3c also feature a T\( \frac{5}{2} \) relationship, but coincident onsets never occur because they stand in an additional relationship of displacement. When a pair of voices features both types of relationships, \( q \) is the duration that would separate consecutive coincident onsets if there were no displacement, and \( p \) is the shortest possible duration between the moments of potential onsets of the duration \( q \). For example, in Figure 3c, the duration of \( q \) is a dotted whole note. If dotted-whole-note durations began at the first onsets shown in each voice, the duration of \( p \) would be a dotted quarter note. However, beginning dotted-whole-note durations on the respective second onsets in each voice results in a \( p \) duration of an eighth note, and since this is the shortest possible \( p \), the displacement relationship is D\( \frac{1}{12} \), the ratio of an eighth note to a dotted whole note. Note that the co-occurrence of an irreducible tempo relationship and a displacement relationship between two voices illustrated in Figure 3c differs from situations when one pair of voices in a rhythmic texture manifests an irreducible tempo relationship and a
different pair of voices in the same texture stands in a displacement relationship (see the discussion of Example 10 in section 3.2).

In states of metrical dissonance, there may be two or more voices in irreducible tempo relationships or displacement relationships with the set of hierarchical voices, in which case these additional voices might or might not be hierarchically coordinated with one another. If there are two or more different sets of hierarchically coordinated voices, then the texture effectively contains multiple superimposed conventional meters. Non-isochronous voices can also appear, but they must occur within a set of hierarchically coordinated voices, following the same limitations as in conventional meter (i.e., the non-isochronous voice is an ostinato and has coincident onsets with isochronous voices in the texture as outlined above).

Roeder’s (1994) method for pulse-stream analysis of rhythmic polyphony is the previous model of meter that rhythmic voicing most closely resembles. One may readily consider each pulse stream to be an isochronous rhythmic voice that is not subject to constraints for synchronization with other voices and is less likely to persist without interruption than a voice in a texture of conventional meter or metrical dissonance. Although voices sometimes join and disappear from textures in conventional meter and metrical dissonance, in both types of organization at least one pair of hierarchically coordinated voices always remains, and in metrical dissonance there is at least one other isochronous voice in an irreducible tempo relationship or a displacement relationship with the hierarchical voices. Without such a requirement, voices in rhythmic polyphony tend to enter and dissipate more frequently.
While Roeder’s (1994; 2001; 2003) applications of pulse-stream analysis are entirely consistent with the principles of rhythmic voicing, the preferences guiding the determination of rhythmic voices in the present study differ from Roeder’s in two respects. The first difference concerns the conception of voice identity. In pulse-stream analysis, the duration between onsets and the orientation in relation to other voices determines the identity of an isochronous voice. Thus, for example, a rhythmic voice corresponding to the notated quarter note (labeled pulse stream 1) in Roeder’s (2001, Fig. 2, par. 5.14) analysis of a passage from Bartók’s “With Drums and Pipes” dissipates after five bars but then returns several bars later. According to Roeder (2001), we know that the same voice is returning in spite of the interruption because its onsets again coincide with the notated quarter note. Although the analysis of Adès’s Piano Quintet in Chapter 4 employs a similar strategy in organizing repeated displacements of a set of coordinated voices, my general approach to voice identity favors continuity within a voice and economy in the number of voices instead of fixed duration and orientation. For instance, because isochrony is not an absolute requirement of rhythmic voicing, the duration between successive onsets can change even in an otherwise isochronous voice. Figure 4 illustrates the difference between these two alternatives. Like Roeder’s (2001) analysis, Figure 4a shows one voice dissipating and then reentering, with a second voice appearing in the interim. Figure 4b represents the same series of onsets within a single voice that switches from quarter-note durations to dotted-quarter-note durations and back, portraying greater intra-voice continuity and fewer total voices but sacrificing the durational specificity of each voice’s identity. Such a switch within a voice could occur in a variety of circumstances, but it seems most convincing if, as in Figure 4b, the change
Figure 4. Differing criteria for rhythmic-voice identity.

a. Duration and orientation of rhythm.

1
\[ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \]

2
\[ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \]

b. Continuity and economy of voices.

\[ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \]
from one duration to another takes place as efficiently as possible, without any other
durational values separating the quarter notes and dotted quarter notes in the rhythmic
series. Switches of durations in isochronous voices are also conceivable in conventional
meter and metrical dissonance, as at a change of meter between two sections of a piece,
but they are much more common in rhythmic polyphony.

In addition to mostly isochronous voices that change durations, my rhythmic-
voicing analyses also diverge from pulse-stream analysis by including non-isochronous
ostinatos. As in the first two types of rhythmic organization, these ostinatos often feature
coordinated isochronous voices, but because rhythmic polyphony encompasses any kind
of synchronization, a non-isochronous ostinato is not required to meet conditions (2) and
(3) for non-isochronous voices in conventional meter.

The final and freest type of rhythmic organization is fragmentary meter. Beyond
suggesting the possibility of negotiating some correlation between rhythmic voices and
the rows of interpretive symbols in Hasty’s (1997, 115) “hierarchy of beginnings,” I will
not propose a translation of projective analysis into rhythmic voicing because of the
conceptual distance that Hasty (1997) strives to maintain between his theory and the
other approaches considered here. Although fragmentary meter often incorporates
fleeting instances of isochrony and coincident onsets, the lack of constraints on the
regularity and synchronization of voices allows for numerous rhythmic textures. Since
non-isochronous voices no longer necessarily conform to ostinatos, decisions about
onsets depend more heavily on invariance that might lead us to hear continuity in a voice,

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14 In speaking of a lack of constraints on the voices, I refer only to the possibilities
for analysis, and certainly do not mean to imply a lack of control of rhythmic materials
on the part of the composer; indeed, revealing contextually determined constraints could
be the primary motivation for a rhythmic-voicing analysis of fragmentary meter.

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such as recurrences of the same type of accent, appearance of accents in the same timbre or register, and parallelism with other grouping and accentuation in the music. As a simple demonstration of voicing established through consistent accentuation, Example 2 identifies two rhythmic voices, an isochronous voice in eighth notes and a slower non-isochronous voice, in a familiar excerpt from the beginning of the “Augurs of Spring” in Stravinsky’s Rite of Spring. Notated dynamic accents and added attacks in the horns provide the sole differentiation in the series of reiterated, isochronous chords, maintaining an accentual equality that justifies the inclusion of these onsets in the same non-isochronous voice. This voice has no apparent periodicity, so it is not metrical and might be more difficult to hear as a coherent series of durations than the isochronous voices and ostinatos that I have discussed up to this point. Nonetheless, since the onsets that determine the durations of a rhythm depend on musical events, perceived similarity of events is sufficient to establish a rhythmic voice in the absence of similarity of durations.

As an example of a more complicated texture that could occur in a passage of fragmentary meter, Figure 5 presents two brief episodes of regularity and synchronization among three non-isochronous voices. We will assume that consistency of accentuation and other factors support the identification of these rhythmic voices. Initially, voice 1 and voice 2 have isochronous half notes in a $D_\frac{1}{2}$ relationship, but before long onsets in voice 1 adjust to triplet quarter notes, every third of which coincides with the continuing half notes in voice 2. Voice 3 enters at the second such coincidence, so that the texture

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15 See Code (2007) for a recent analysis of the passage and discussion of several other perspectives. The present interpretation is trivial in the context of previous analyses, but it serves to illustrate how a freely non-isochronous voice could be determined.
Figure 5. Two episodes of regularity and synchronization among three non-isochronous voices.
begins to suggest three isochronous, hierarchically coordinated voices. However, the hint of conventional meter dissolves after only the second coincidence of onsets in all three voices, with voice 2 changing to isochronous dotted quarter notes, voice 1 doubling its durations to triplet half notes, and voice 3 also departing from its initial whole-note duration. These changes result in numerous non-coincident onsets, but when voice 1 disappears from the texture, the remaining two voices again hint at coordinated isochrony in dotted-quarter-note and dotted-half-note durations before diverging again at the end of the example. The frequently shifting characteristics of the rhythmic voices and their interaction reflect the “small constituent gestures” of the “contracted and dense present” in fragmentary meter, a condition that makes much greater demands on a listener’s attention than the largely constant pattern in conventional meter (Hasty 1997, 280-1). Voice 2 maintains some continuity in this fragmented texture, but interruption of all voices could also separate the episodes of more predictable organization.

Relying on the same apparatus to account for conventional meter, metrical dissonance, rhythmic polyphony, and fragmentary meter allows us to attribute the differences between these types of periodicity to the relationships among their rhythmic voices instead of to conceptually different processes. Although this approach arguably sacrifices some theoretical depth in describing each class of meter, it facilitates analysis of the changes in rhythmic regularity and synchronization that can occur within a single work. We might imagine a composition that realizes a process of metrical entropy by tracing the spectrum of the four states described above: beginning with a strictly hierarchical meter, one or more rhythmic voices introduce metrical dissonance by becoming displaced from the prevailing pattern or by changing tempo. This rift in the
coordination of voices then widens, so that synchronization with reference to any single hierarchy breaks down, resulting in rhythmic polyphony. Finally, fragmentary meter occurs when even the equal durations between successive events in an individual voice destabilize. There are many other possible relationships among rhythmic voices and ways of moving from one set of relationships to another, but as the analysis in Chapter 3 shows, rhythmic voicing in George Benjamin’s second *Invention* follows a course similar to this hypothetical scenario. Before proceeding to this and the other analyses of Benjamin’s and Adès’s music, though, Chapter 2 introduces a theory of cognitive schemata that guides the analyses by relating all three other types of rhythmic organization to conventional meter.
Chapter 2: Schema Theory

2.1 Metrical Schemata

The listener-oriented application of rhythmic voicing described in Chapter 1 entails some mental representation of the music, a coherent, meaningful, and useful portrayal of knowledge that is created through the largely unconscious process of organizing sensory information called cognition (Neisser 1967, 4). The composer, performer, and listener of a particular work each hold their own respective versions of the mental representation, which necessarily differ as a result of the communication from composer to performer by means of the score and from performer to listener by means of a performance. The rhythmic texture posited in a rhythmic voicing analysis thus constitutes a possible version, albeit highly speculative, of a listener’s mental representation of rhythmic organization in the passage in question, and the analytical preferences guiding the determination of rhythmic voices produce the effect of the cognitive structures that function in the process of creating this representation.

One of the main types of cognitive structures involved in acquiring and storing sensory data is the schema (Rumelhart 1980). A schema is a representation of knowledge that has been generalized from past experience, and it serves as a framework to guide the interpretation of new experiences (Rumelhart 1980, 34; McAdams 1989, 191). A single schema contains multiple associated pieces of information, and as generalized knowledge, each of these components can be understood as a variable that is subject to constraints based on observations of its specific values in the scenarios that gave rise to the schema (Rumelhart 1980, 35-7). Among the types of schemata that researchers have proposed are event schemata, which contain information about the content and ordering
of a related series of events, such as the steps involved in attending a concert (Mandler 1984, 14).

Event schemata seem particularly well suited to understanding music because of the temporal nature of music and the frequent use of variations on a single pattern. Mandler (1984, 85-6, 14) observes that research on listener judgments of melodic pattern completion (e.g., Krumhansl and Shepard 1979; Krumhansl and Keil 1982) suggests a mental representation of melodic diatonicism that displays the same kind of organizational structure as an event schema, in that the components of the representation are related to one another in both a temporal sequence and as parts of a whole. Building on the basic features of schema theory and on Rosner and Meyer’s (1982; 1986) findings that listeners can recognize conventional melodic patterns in excerpts from classical recordings, Gjerdingen (1988) identifies in the classical repertoire a schema for melodic motion from $\hat{1}$ to $\hat{7}$ and then from $\hat{4}$ to $\hat{3}$. Gjerdingen’s (1988, 64) $\hat{1}$–$\hat{7}$…$\hat{4}$–$\hat{3}$ schema consists not only of a melodic pattern, but also of coordinated motion of the bass line and harmony in relation to the metrical context. Individual examples of the $\hat{1}$–$\hat{7}$…$\hat{4}$–$\hat{3}$ schema exhibit considerable variation because, like the experience of going to a particular concert, each is one of the nearly infinite possibilities for instantiating the same configuration of basic components.\footnote{In more recent work, Gjerdingen (2007) employs the same approach to describe numerous schemata that are characteristic of the galant style, including Joseph Riepel’s fonte, monte, and ponte patterns. On the basis of a survey of nineteenth-century Lieder, Malin (2008a) also introduces the concept of a declamatory schema as a typical pattern for mapping the syllables of poetic verse onto beats in musical meter. Although he does not use the term “schema,” Zbikowski (2004, 273) defines “conceptual models” similarly as “relatively basic cognitive structures that act as guides for reasoning and inference,” and he applies them to the analysis of rhythm in order to account for the cultural knowledge that listeners use in understanding grooves in popular music.}

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I propose that schematic cognition is also involved in hearing conventional meter. A *metrical schema* is a pattern of rhythmic organization that corresponds to a familiar metrical type such as simple triple or compound duple. If we define conventional meter in terms of rhythmic voices as in section 1.3, then a metrical schema consists of a set of two or more isochronous, hierarchically coordinated rhythmic voices, possibly with additional non-isochronous ostinatos. Through the experience of listening to many pieces in a given type of meter, a listener acquires a schema for that meter which then guides future rhythmic experiences. During a particular listening experience, this schema constitutes an idealized rhythmic texture that, once activated by cues in the music, both influences the identification of rhythmic voices from the incoming accentual information and also acts as a standard for interpreting the particular instantiation of the schema that the identified rhythmic texture represents. Metrical schemata are more basic and general than the schemata that Gjerdingen (1988; 2007, 6) offers to characterize common classical melodic patterns or the galant “repertory of stock musical phrases” because a metrical schema is less stylistically specific, may persist for the entirety of a movement or piece, and contains direct knowledge of the rhythmic dimension only. As we saw in the previous chapter, though, factors in various musical parameters contribute to the accentual information on which the rhythms in an instantiation of a metrical schema are based.

In addition to the wide range of melodic, harmonic, and timbral combinations that may realize the accentual pattern of a particular metrical schema, the variability of schema components manifests in the phenomenon of *categorical perception* of rhythm. The relative durations in a musical performance hardly ever conform precisely to the
simple ratios of durations that typically occur in conventional rhythmic notation (e.g., 1:1 for two quarter notes, 2:1 for a quarter note and an eighth note, 3:1 for a dotted quarter note and an eighth note); to the contrary, performers constantly introduce small deviations from the notated rhythm, both intentionally and unintentionally. Yet listeners still tend to interpret the complex and fluctuating durations of the musical stimulus in terms of simple ratios, suggesting that the ratios represent categories structuring rhythmic perception (Sloboda 1985, 30).17 In conventional meter, this effect can be explained as the result of the variability in relative durations that a metrical schema permits. Although the relative durations in a schema are idealized according to simple ratios, we perceive departures from the exact durations to match the schema as long as each duration does not fall too far from the target value. Significantly, we do not simply ignore these discrepancies, but understand them within the domain of the expressive variations mentioned in section 1.3, as features of the affective and stylistic quality of the music instead of its durations (Sloboda 1985, 30-1; Clarke 1987, 30-1).18 As we will see in Chapter 4, the frequent changes in successive notated durations in Adès’s music can sometimes be heard as such expressive timing variations of a more regular pattern.

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17 Experimental studies of the categorical perception of rhythm (e.g., Clarke 1987; Schulze 1989; Windsor 1993) provide equivocal evidence for the existence of the phenomenon, but the lack of strong confirmation could be due to difficulties in developing a suitable experimental design. London (2004, 170, n. 6) argues that categorical perception of rhythm occurs at least in the context of conventional meter.18 The perception of expressive timing variations is also consistent with the schema model, because, as Mandler (1984, 105) emphasizes, the expectations that a schema creates allow us to use minimal attention in processing the commonplace features of an experience so that more attention can be devoted to information that deviates from the schematic norm. A metrical schema thus facilitates interpretation of the subtleties of expressive variations by taking the presence of simple durational ratios as a given.
A schematic conception of conventional meter is not a radical departure from existing theories. For instance, the goal of Lerdahl and Jackendoff’s (1983, 3) musical grammar is to articulate “the largely unconscious knowledge … that the listener brings to his hearing—a knowledge that enables him to organize and make coherent the surface patterns.” Their rules for the characteristics of beat levels are thus intended to serve much the same function as a musical schema, and indeed, since a schema can be defined as “a set of rules” (Evans 1967, 87), it might even be possible to regard Lerdahl and Jackendoff’s (1983) work as a theory of musical schemata. Similarly, although London (2004, 12) focuses primarily on human perceptual capabilities and limitations in developing his formulation of meter as an attentional behavior, he regards the cycle of metrical attending as an “anticipatory schema” that “represents the temporal arrangement of a series of events.”

Shifting theoretical emphasis from a grammatical system or a pattern of attention to the schematic representation of meter and how it serves to interpret musical information enables us to explore metrical hearing of a broader range of rhythmic phenomena. For Lerdahl and Jackendoff (1983) and London (2004), rhythmic features must adhere fairly closely to the theoretical constraints in order to be understood metrically. While metrical schemata are acquired under such conditions, and themselves constitute representations that obey similar restrictions, I conceive of schemata as being sufficiently flexible that they can still provide an interpretive context for hearing rhythms that depart substantially from conventional meter. Characteristics of a particular rhythm that resemble the components of a metrical schema in their organization, as well as concomitant features of other musical parameters (e.g., harmony, timbre, or texture) that
evoke a typical stylistic context for conventional meter, are likely to activate a metrical schema that can then influence our hearing. A metrical schema can potentially interpret even major deviations from conventional meter, especially if no alternative schema is apparent and the metrical schema contributes to a rewarding experience of the piece.

Relying on a metrical schema to make sense of non-conventional rhythms does not efface the difference of these rhythms from conventional meter. To the contrary, since schemata draw our attention to unexpected or unusual features, the metrical schema acts as a norm that promotes the recognition and interpretation of departures from meter. Rhythms that clearly do not conform to conventional meter but are understood schematically in relation to meter can be termed *metrical allusions* and classified into three general types. *Simple metrical allusion* occurs when the texture of rhythmic voices apparently displays the high degree of regularity and synchronization that we expect in conventional meter, but is nonetheless set apart from conventional meter by details or context that would be unusual in a canonical example of conventional meter. For instance, the two episodes of isochronous coordination among the voices in Figure 5 are better regarded as fleeting allusions to conventional meter than true instantiations of such meter, because conventional meter would normally be a much more consistent property of the texture of rhythmic voices.

Another form of metrical allusion is *disjunction*, wherein the rhythmic voices demonstrate less synchronization than in conventional meter. Disjunction encompasses metrical dissonance and a variety of polyphonic rhythmic phenomena that can be described in terms of the types of irreducible tempo relationships and displacement relationships illustrated in Figure 3. In order for a given example of rhythmic polyphony
to constitute disjunction, however, there must be some reason to associate its disjunct voices with conventional meter, or a metrical schema (or schemata) will not be activated. Finally, whereas disjunction pertains to rhythmic synchronization, metrical distortion refers to decreased rhythmic regularity, as when non-isochronous voices that are not ostinatos appear in a texture of fragmentary meter. In a similar manner to disjunction, to be regarded as an example of distortion, a texture with non-isochronous voices must bear some relationship to conventional meter, such as the suggestion that its non-isochronous durations can be heard as alterations of metrical isochrony.

2.2 Image Schemata

Cognitive schemata are also useful for describing how a listener might understand deviations from conventional meter to contribute to musical processes and a work’s overall form. Whereas musical schemata, including schemata for meter, are acquired from experiences of listening to music and consist primarily of musical components, schemata originating in non-musical experience can also affect our representation of music when applied metaphorically. Lakoff and Johnson (1980, 3-6) define metaphor not as a literary device, but as an extremely common conceptual strategy that applies a schema acquired in one area of experience in the cognition of a different type of experience. The kind of schema that most commonly functions metaphorically, which Johnson (1987, 23, 19-21, 28) calls an image schema, arises through basic bodily experiences of space and time as we interact with our immediate physical surroundings, and then supports the understanding of a wide range of concrete and abstract circumstances that do not deal directly with the body.
Numerous scholars have applied cognitive metaphor theory and image schemata to music, most commonly as a means of analyzing music-theoretical discourse. For instance, Saslaw (1996; 1997-98) describes the image schemata that underlie aspects of Riemann’s, Schenker’s, and Schoenberg’s theoretical writings, and Zbikowski (1997) discusses the role of cognitive metaphors and schemata in differing conceptions of hierarchy that have shaped theory and analysis. Similarly, Urista (2001) identifies image schemata as the source of metaphor and embodiment in Schenker’s, Schoenberg’s, and Zuckerkandl’s theories of tonality, and argues that the use of different image schemata helps to account for discrepancies between analyses of the same piece. In contrast, rather than revealing embodied metaphor in existing theories and analyses, Cox (1999, 59-63) proposes a theory of listener embodiment through “imagined imitation,” or mimesis, in order to explain how metaphor can contribute to a listener’s musical experience. Brower (2000) also develops a theory of musical meaning based largely on the interaction of image schemata with the musical schemata that reflect melodic, harmonic, and phrasing norms in tonal music, supporting the analysis of musical narrative through comparison of parallel passages.

According to Brower’s (2000) model, image schemata contribute to musical thought in at least two distinct ways. First, image schemata are integral to the structuring of many of our musical schemata, as in the conception of comparative pitch in terms of verticality (Zbikowski 2002, 68-71; Cox 1999), melodic change as obeying physical forces (Brower 2000, 334-5), harmonic progression as directed motion (Saslaw 1996, 222-3), and metrical time spans as containers. Brower’s (2000, 352-3) image schemata for musical plot structure, such as “departure from and return to a pathway” and
“overcoming blockage,” belong to a second interpretive layer that further organizes the information parsed by basic musical schemata. Musical schemata help a listener to recognize familiar melodic, harmonic, and metrical patterns, and the application of image schemata on a higher level interprets the relationships that emerge among these musical entities to augment perceptions of process, form, and expression.19

One way in which image schemata can interpret relationships among musical entities is by comparing the extent of each particular entity’s deviation from the norm that its musical schema represents. The instantiations of image schemata in Brower’s (2000, 356-70) narrative analysis of a Schubert Lied, for example, track how the phrases of the song depart from convention and from motivic patterns established within the piece. Similarly, we might postulate that the activation of an image schema is what allows us to hear deviations from the exact durations of a metrical schema as expressive. In this case, the image schema would compare the extent of the durational deviations in a measure or phrase and interpret this information according to a metaphorical pattern, as in the accelerating downward motion from upbeat to downbeat that Rothstein (2005, par. 16) hears as the result of the “gravitational force” of the downbeat in Chopinesque rubato.

Although metrical allusions may depart from a metrical schema much more substantially than expressive variation does, the image-schematic interpretation of changing metrical allusions can be understood to function in the same manner, matching the series of allusions to a metaphorical pattern based on the extent of each allusion’s deviation from the metrical schema. An analysis following this model thus compares the magnitude of deviations from the metrical schema and provides an appropriate image

19 This type of hierarchical organization is typical of event schemata (Mandler 1984, 14).
schema for interpreting these differences. As in the case of the comparison of accentual strength involved in determining rhythmic voices, exact, absolute measurement of the magnitude of metrical allusions seems problematic. Nonetheless, my analyses rely on several hypotheses about relative deviation from a metrical schema, applying the basic principle of a direct correlation between the extent of deviation and the amount of separation from the metrical schema, and measuring the amount of separation in duration or the number of independent deviations. These hypotheses serve only as a starting point for analytical comparisons; they do not address many potential comparisons, and are often contradicted in the evaluation of particular cases.

Within the category of simple allusion, greater deviation corresponds to a greater number of unusual features with respect to the metrical schema, such as an extreme tempo or five beat classes. Krebs’s (1999, 57-9) discussion of the intensity of metrical dissonances—or, as we have defined them, non-coincident relationships among onsets in rhythmic voices—informs comparative judgments about disjunction. The following comparisons assume that one of the rhythmic voices in a non-coincident relationship matches a voice in the referential metrical schema. In irreducible tempo relationships, the greater the number of non-coincident onsets separating every instance of coincident onsets, the greater the deviation (Krebs 1999, 57). Contrary to Krebs’s (1999, 57) formulation, in displacement relationships I link greater durations between non-coincident onsets with greater deviation. However, the potential for non-coincident onsets to suggest a faster, coordinated isochronous voice complicates this measurement. For instance, even though \( \frac{1}{2} \) is the greatest possible value of \( \frac{p}{q} \), in many contexts a D\( \frac{1}{2} \) relationship seems minimally deviant because it suggests another isochronous voice.
coordinated with and moving twice as fast as each voice in the displaced pair. To approximate the deviation in a displacement relationship while taking into account the possibility of a voice that moves twice, three times, or four times as fast as each displaced voice, first find a set of four differences by subtracting each of the values \(0, \frac{1}{4}, \frac{1}{3}, \text{and } \frac{1}{2}\) from \(\frac{p}{q}\). Let \(r\) be whichever of these four differences has the least absolute value. The greater the value of \(r\), the greater the deviation of the displacement relationship.

In general, a combined tempo and displacement relationship, such as that in Figure 3c, is taken to be more deviant than an instance of either of the two categories on its own, and the greater the number of non-coincident pairs of voices in a rhythmic texture, the greater the deviation. Like Krebs (1999, 57), I offer no rule for comparing irreducible tempo relationships with displacement relationships. Greater deviation in examples of distortion results from greater durations between the onsets in the rhythmic voices of a schema’s instantiation and their corresponding onsets in the schema itself. Finally, in comparing different types of metrical allusion, simple allusion is the least deviant type, and the greater the number of independent disjunct or distorted voices, the greater the deviation.

As Krebs (1999, 58) observes, contextual factors in the realization of a pattern of rhythmic voices have greater significance for comparing deviations than these general guidelines. For instance, both parts of Example 3 realize the same pattern of disjunct rhythmic voices in a \(T^{\frac{4}{3}}\) relationship. In Example 3a, the registral and dynamic equality and harmonic dissonance of the two parts emphasize the disjunction; in other words, the irreducible tempo relationship is highly salient in the rhythmic texture. Thus, Example 3a might be heard as more deviant from conventional meter than Example 3b, which
Example 3. Differing degrees of perceived deviation from conventional meter in two realizations of a $T\frac{4}{3}$ relationship.

a. Greater deviation

b. Lesser deviation
downplays the disjunction through dynamic and harmonic-change accents on coincident onsets, as well as greater differentiation of the parts in the sense that the separate registers, dynamics, and melodic patterns suggest melody and accompaniment instead of contrapuntal equality.\(^\text{20}\)

In addition to such differences in individual textures, the context of a series of metrical allusions could make either of these examples seem more or less deviant than it does on its own if comparison to the preceding allusions leads a listener to expect a certain level of deviation. I assume that listeners have a general expectation for each successive change of deviation to repeat the direction of a preceding change, so, for instance, if the second metrically allusive passage in a piece is more deviant than the first, we will tend to hear the third passage as even more deviant than the second if its characteristics do not indicate otherwise. All else being equal, and assuming passages without large differences among their deviant components, a succession of allusive states such as \(<\text{simple allusion, disjunction, distortion, disjunction and distortion}>\) could be heard to realize three increases in deviation, and a similar sequence that reverses the order of the second and third elements, \(<\text{simple allusion, distortion, disjunction, disjunction and distortion}>\), would demonstrate the same increase. Of course, this expectation is often denied, but considering the difficulty in comparing deviations, it is appealing as a heuristic that minimizes changes of direction and thereby encourages

\(^{20}\) This discussion of disjunction in Example 3 only addresses the two isochronous voices determined by the series of note onsets in the two parts. Onsets in possible slower voices moving in whole notes might or might not coincide with the notated downbeats. For instance, the opening of the melody on the upper staff in Example 3a might be heard to suggest G-major harmony, promoting an isochronous voice with whole-note durations beginning on the second notated quarter note in each bar. Any displacement relationships between whole-note voices in the example are separate from the irreducible tempo relationship between the quarter-note and triplet-half-note voices.
relatively simple patterns in series of deviations. A broader expectation for an initial low level of deviation that increases to a peak and then returns to a low level also affects hearing of deviation in a circumscribed sequence of deviations such as an entire movement.

To summarize the relative deviation of metrical allusions over the course of a piece without specifying exact values, I use the style of contour notation that has been applied to describe relative pitch and duration (see, e.g., Friedmann 1985; Marvin 1991). For a piece with $n$ distinct sections of metrical allusion in which each section deviates from the referential metrical schema to a different degree, a different number from 0 to $n-1$ is assigned to each of the sections, with 0 indicating the least deviation relative to the other sections. The increments between values of deviation are left entirely undefined and are not necessarily equal (e.g., a value of 2 means more deviation than a value of 1, but makes no assertion about how much more; the amount of deviation between the values 2 and 3 in the same series could be radically different than that between 1 and 2). So, for instance, the pattern of relative deviation in a piece with six sections of metrical allusion that gradually increase and then decrease in deviation could be expressed with a contour such as $<1 \ 3 \ 5 \ 4 \ 2 \ 0>$.

The determination of an appropriate image schema for interpreting deviations from conventional meter is constrained by the invariance hypothesis, which requires that the structure of the components of the metaphorical image schema does not alter the structure of the corresponding components in the original schema (Turner 1993, 291-2). This rule limits the possible image-schematic metaphors, but in most cases there are still multiple viable options. For example, Zbikowski (2002, 68-71) observes that image
schemata for both height and size provide suitable metaphors for pitch comparison because, like pitch, both vertical space and object size are continuous spectra that we divide into the discrete units. Adlington (2003, 297-300) argues that motion is the most common feature of metaphorical image schemata for interpreting relationships among musical events at different times in a piece, suggesting that metaphors of movement arise readily in the attempt to grasp music’s temporal continuity, but he proposes that we overlook the many other image schemata that contribute to musical hearing when we place too much emphasis on motion. Similarly, Johnson (2007, 259) claims that the application of multiple, sometimes contradictory image-schematic metaphors is what allows us “to understand the richness and complexity of [musical] experience.”

Bearing in mind, then, that other possibilities exist for interpreting changing metrical states, I employ an image schema for tension and relaxation to compare metrical allusions. In this metaphor, the idealized metrical schema for conventional meter, perfectly realized at a constant tempo and with no contrametrical accents, corresponds to a state of complete relaxation. Deviation from the relevant conventional metrical schema is interpreted as tension, so the greater the deviation, the greater the contrametrical tension in the passage. To the extent that different levels of deviation from a metrical schema are clearly distinguished, the metaphor thus establishes a specific, direct correlation between tension and metrical allusion.

Tension is an appropriate image schema for interpreting metrical deviation because the schematic structure of the physical states of tension and relaxation matches the structure of metrical deviation and conformity: “the sensations of tautness and pull that lie at the core of physical sensations of tension” (Adlington 2003, 308, n. 51)
correspond to the perceived character of alterations of the metrical pattern, while the sensation of muscular relaxation corresponds to the experience of familiar and predictable organization in an idealization of conventional meter. A schema for tension and relaxation also seems better suited to the domain of meter than a motion-oriented schema, at least one implying orientation toward a particular goal. Whereas some aspects of conventional tonal music, such as the system of functional harmony, involve expectations for specific future events, such as the occurrence of the tonic triad, relationships of different metrical states do not carry such strong connotations for future events. As mentioned above, certain patterns of metrical allusions, especially an initial increase and subsequent decrease in deviation, might occur frequently and create schematic expectations for completion of the pattern, but a given metrical state does not imply its successor with the same certainty and specificity as a dominant harmony does.

Furthermore, like motion, the metaphor of tension is a longstanding part of Western musical discourse. For example, Schenker (2001, xxiv) refers to “inner tension and its corresponding outward fulfillment” as “the highest principle which is common to all arts,” and Schoenberg (1984, 123) considers “the real idea of [a] composition” (Schoenberg’s emphasis) to be the means of balancing the tension that inheres in any musical sequence. In relation to the present theoretical perspective, Brower (2000) mentions the opposition between tension and relaxation in connection with several of her image schemata for features of tonal music. Lerdahl and Jackendoff (1983, 179-81) explain the meaning of their prolongational reductions of pitch in terms of tension and relaxation, and Bigand (1993) seeks to confirm experimentally the operation of a listener schema for tension and relaxation in accordance with Lerdahl and Jackendoff’s (1983)
theory of prolongation. Temperley (2001, 307-17) suggests a correlation between the degree of perceived musical tension in a passage and its deviation from expectations for harmony, counterpoint, and meter in a manner similar to my application of the tension schema, but discusses this possibility in direct relation to the output of his rule-based computer model of music rather than in a context mediated by schemata. Conversely, Malin (2008b, 67) includes tension alongside other schema-based metaphors including motion, desire, and agency in analyzing the metaphorical energy of meter and rhythm, associating tension with rhythmic phenomena such as syncopation, but he switches among a variety of energetic metaphors in response to the text and does not establish a specific correlation of musical characteristics with degrees of tension.

Having introduced the analysis of rhythmic voicing and explained allusion to conventional meter by means of cognitive schemata as a theoretical approach to guide analysis, we move to an application of this method to examples from the music of two contemporary British composers, George Benjamin and Thomas Adès.
Chapter 3: Analysis of Works by George Benjamin

3.1 Metrical Allusion in *Sudden Time*

George Benjamin (b. 1960) studied composition with Olivier Messiaen and Alexander Goehr, and his first pieces feature careful orchestration and harmonies reminiscent of spectralism (Anderson 2001). From 1982 to 1993, Benjamin struggled to forge a more contrapuntal style, producing few large works until the completion of an orchestral project, *Sudden Time*, which he had been planning for the entire decade (Anderson 2001; Machart 1997, 52). The increased focus on meter and time in this fifteen-minute movement is one of the most notable changes from Benjamin’s earlier output. Benjamin (1997b, vi) describes an experience of shifting temporal perception as one of the ideas underlying the conception of *Sudden Time*, and he cites a line by Wallace Stevens (1954, 237), “it was like sudden time in a world without time,” as the source of the title. Furthermore, the composer mentions that the work’s gestation included “years [of] investigating the perception of pulse, the tiny changes in duration that destroy a pulse, combinations of pulses, the idea of divisive rhythm within the pulse [and] … metre, that is, the hierarchy of strong beats and accentuation” (Benjamin 1997a, 30). In a BBC radio interview, Benjamin (2008) explains how the main theme, which is in a slow $\frac{3}{4}$ meter, passes through a series of transformations over the course of the piece that obscure or clarify its motivic and metrical identity.

Following a four-minute introductory section, the theme of *Sudden Time* first appears in the horns, with accompaniment in harmonics in the violas and violoncellos (Example 4). The material in the four horns is extremely simple, consisting of dyads in alternating quarter notes and half notes to make up four bars of $\frac{3}{4}$ that divide into two
Example 4. Allusion to triple meter in the first statement of the theme of George Benjamin, *Sudden Time*, bb. 98-102. All parts are in concert pitch in this and all subsequent examples.
two-bar groups by way of pitch parallelism. Like the pattern illustrated in Figure 1 and Example 1, grouping is offset from accentuation in that each group begins with an anacrusis on the third quarter note in each bar, while agogic and dynamic accents signal the downbeats. The accompanying strings articulate the second quarter note in the bar and add emphasis to the third quarter note, which is usually a dynamic peak in each line. The accentuation on the anacrusis reflects Benjamin’s (2008) explanation of \( \frac{3}{4} \) meter as characterized by the sequence of “a very important upbeat, and then a downbeat, then a weaker second beat.” This carefully controlled, regular pattern differentiates the accentuation of the three beat classes and can be interpreted in terms of the three rhythmic voices below the score in Example 4. Dotted vertical lines connect the onsets in the rhythmic voices to the corresponding onsets in the score. Although the slow tempo of 48 quarter notes per minute means that some performances of this passage may not activate strongly a metrical schema for triple meter, Benjamin (2008) clearly intends for the meter to be aurally recognizable, stating that “[this] arrival of a steady meter is absolutely unexpected, and a bit of a shock.” Considering that the theme emerges from a long pause at the end of the turbulent introduction and then dissolves into material that is rhythmically much more complicated, it exemplifies one of the main ways of achieving simple metrical allusion.

Benjamin (2008) claims that all of the ensuing material derives from these few bars, but except for other brief instances of simple allusion, such as the duet between English horn and harp in bars 169 to 173, references to triple meter are usually much more difficult to discern. An extended period of metrical stability only appears at the conclusion of the piece in the form of a viola solo accompanied by two sets of mini-tablas.

$\frac{3}{8}$ \(\text{SOLA, sostenuto, appassionato}\)

Viola

\(\text{ff} \quad \text{fff} \quad \text{fff} \quad \text{fff} \quad \text{fff} \quad \text{fff} \quad \text{fff} \quad \text{fff}\)
tuned to three different pitches. As Example 5 shows, the tablas articulate a triple-meter pattern that gives dynamic, contour, and agogic accent to the downbeat, weaker dynamic and agogic accent to the second beat class, and slight dynamic accent to the third beat class of each measure, with a further distinction between the speed and length of the rolls that lead to the first and second beat-class onsets. The tablas thus articulate tactus and measure voices, plus a non-isochronous voice with onsets on the first and second beat classes instead of the first and third beat classes as in Example 4. In spite of changes to the time signatures and notated tempos in this final section, the rhythmic voices originating in the tablas persist until the end of the movement at a constant tempo equal to that of the initial triple meter in Example 4. When the solo viola enters a few measures after the tablas, Benjamin makes its connection to the triple-meter schema explicit by supplementing the part with rhythmic cues in $\frac{3}{4}$ that effectively identify one of the rhythmic voices (see Example 6). The cues clarify the metrical allusion that the viola’s agogic, dynamic, and contour accents are intended to convey, even when the time signature changes and the figuration becomes more elaborate.

After the tablas and viola establish this allusion in bars 394 to 402, a second set of tablas comes in and begins to alter the metrical pattern by shortening the tactus durations to half notes and then triplet half notes (see bars 403 to 406 in Example 7). Since the viola maintains its own tempo, this change results in two different sets of rhythmic voices, each with its own hierarchically coordinated structure, for a disjunction between two triple meters simultaneously sounding at different tempos.\(^{21}\) An outburst in the full

\(^{21}\) The two harp parts in bars 403 to 406, omitted from the reduction in Example 7, further complicate the rhythmic texture in these transitional bars by adding more disjunct voices.
Example 7 continued.
Example 7 continued.
orchestra from bars 406 to 414 highlights this metrical conflict, with the original rhythmic voices in the viola transferring to the woodwinds, and the brass taking up the new, faster meter. Although four successive onsets are missing in bars 407 and 408 from the tactus voice in triplet half notes, in bars 409 to 412 both meters feature tactus and measure voices, as well as non-isochronous voices with onsets on the first and second beat classes of the respective meters. The non-isochronous voices are dictated by subtle but systematic differences in Benjamin’s dynamic markings, such as the sequence <sff, sffp, fp> on the alto flutes’ attacks of the first, second, and third beat classes of the slower meter. In addition, although these main onsets in the alto flutes contribute to the rhythmic voices in the slower meter, the seemingly non-isochronous onsets on triple divisions of the quarter note actually belong to the triplet-half-note voice of the faster meter. The downbeats of these two meters coincide on the third quarter note of bar 412, at which point the new meter ceases, leaving only the slower meter from the beginning of the passage. The orchestration thins again in bar 413, and the viola solo resumes on the downbeat of the following bar in time with its rhythmic voices from before this brief interruption.

Figure 6 illustrates how disjunct voices in the passage arise and disappear at moments of coincidence among onsets in all voices, forming what could be understood as a process of splitting and merging of rhythmic voices to create a bounded passage of disjunction. In the figure, a horizontal line separates the two disjunct sets of voices, and vertical lines connect simultaneous onsets between disjunct voices.\textsuperscript{22} A similar process

\textsuperscript{22} In line with the principles of continuity and economy in voice identity explained in section 1.4, the change of isochronous durations in bar 406 is regarded as occurring within voices 3 and 4 instead of originating two new voices.
**Figure 6.** Summary of rhythmic voicing in George Benjamin, *Sudden Time*, bb. 399-414, showing disjunction through splitting and merging of voices. Numbering of rhythmic voices corresponds to Example 7.
of splitting and merging, with three disjunct sets of voices instead of two, takes place in bars 420 to 427, after which the viola’s triple meter holds sway to the end of the piece.

According to the composer, the phenomenon of irregular rhythms “suddenly … becom[ing] regular, and metrical, and even predictable in rhythm … [is] the subject of the whole piece” (Benjamin 2008). If we understand metrical regularity to signify metaphorically the presence of time, and rhythmic irregularity to signify the absence of time, *Sudden Time* could be understood to employ the device of metrical allusion as a means of portraying the image of its title. Although much more extensive study is necessary to understand the movement’s many rhythmic textures and the relationships among them, its general sequence of metrical organization seemingly begins with states that deviate from the triple-meter schema, punctuated by brief periods of minimal deviation as in Example 4, and ends with the extended section of lesser deviation based around the viola solo. This pattern could be heard as the type of change from tension to relaxation suggested in section 2.2, or as a large-scale presentation of the title’s metaphor for the absence and presence of time.

### 3.2 Types of Metrical Allusion in the Second Invention

Several of Benjamin’s orchestral compositions since *Sudden Time* similarly focus on the transformation of thematic material. For example, the first movement of *Palimpsests*, composed in 2000, features a “lyrical polyphonic song” that remains “ever present deep in the background … [and] occasionally returns to the surface” (Benjamin 2004, vii). The second movement of *Three Inventions for Chamber Orchestra* (1995), the first work that Benjamin completed after *Sudden Time*, is ideal for a detailed investigation of the treatment of meter in this type of process because of its brevity and
relatively small orchestral ensemble of 24 players. In the movement “a virtuoso cor
anglais solo announces what appears to be a conventional triple metre; however, within a
very brief time all manner of irregular figuration and unexpected tempo juxtapositions
contort this metre beyond recognition. … only at the very end is metrical regularity
reinstated by an acrobatic clarinet solo” (Benjamin 1997c, iv). Simple allusion,
disjunction, and distortion occur in succession as the piece unfolds.

The second Invention establishes its initial meter quite clearly. Before the English
horn enters, the piano plays a series of isochronous attacks separated by the notated
duration of five triplet eighth notes, and the first, fourth, seventh, and tenth events in this
stream receive contour accent as melodic peaks as well as dynamic accent expressed in
forte dynamics and articulation markings (see Example 8). Thus, the piano part projects
two isochronous, hierarchically coordinated rhythmic voices with a durational ratio of
1:3, constituting the tactus and measure of a triple meter.

The strings, harp, and percussion reinforce and deepen this meter by punctuating
the piano’s onsets. These instruments take turns doubling notes in the piano, so that
collectively they contribute to the tactus voice. In addition, the registral density of this
doubling varies systematically: four parts (crotales, harp, and two violins) double the piano’s first onset, one part (second violin) doubles the second onset, and two parts (harp
and viola) double the third onset. The doubling continues with different combinations of
instruments, but the same cycle repeats so that in each group of three successive piano
onsets, the first receives the strongest accent of registral density, the second receives the
weakest, and the third receives an intermediate accent. Through these changes in
registral-density accent, the orchestra participates in both of the piano’s rhythmic voices
Example 8. Rhythmic voicing in George Benjamin, second *Invention*, bb. 1-5.
and adds a non-isochronous voice (voice 2 in Example 8) that reflects the difference in the accentual strength of beat classes 2 and 3 by including an onset on beat class 3 but not beat class 2. In the English horn solo, dynamic and contour accents coincide with onsets in the measure voice, and Benjamin’s instructions for the soloist to move the bell of the instrument—ascending from beat class 3 to beat class 1, descending from beat class 1 to beat class 2, and not moving from beat class 2 to beat class 3—mark the three beat classes and set them apart from one another.23

As a whole, then, the rhythmic texture at the beginning of the second Invention presents a clear triple meter. However, Benjamin’s unusual notation hints at a feature that distinguishes the passage from common-practice meter. Cutting across the written time signature, the notated tactus duration of five triplet eighth notes implies division of beat classes into five units instead of the normative two or three. Although this subtactus voice is not audible, it helps in parsing the rhythm of the English horn’s complicated figuration, in that all the short note values and nested triplets in the first fifteen bars can be understood as duple or triple subdivisions of the triplet eighth note (see, e.g., the English horn part in Example 10). Furthermore, the notation of tactus durations that emerge later in the piece also suggests quintuple divisions, as in the piano onsets that occur every five sixteenth notes in bars 11 to 15 (see below) and the viola duet in bars 17 to 22 with phrases and accents marked every five triplet sixteenth notes. We might speculate that this subtle recurrence of quintuple divisions represents for the composer a connection to the pentatonic pitch material at the opening of the movement. In any case, the importance of divisions of five in the conceptual structure of the initial triple meter

23 The bell motions evoke Zuckerkandl’s (1956, 168, 171-2) description and graphical representation of the wave-like quality of triple meter.
signals a difference from meter that we would find in an eighteenth- or nineteenth-century composition, so this passage demonstrates another type of simple allusion.

After the first eight bars of the second *Invention*, the highly coordinated orchestral accompaniment gives way to rhythmic voices that conflict with the continuing meter of the English horn solo. Stemming from a unison B♭3 on the downbeat of the sixth measure of the perceived triple meter (the downbeat of bar 9), a solo bassoon and accompanying instruments across the ensemble assert an isochronous tactus voice with dotted-eighth-note durations and a faster voice that divides each dotted eighth into three sixteenth notes (see Example 9). Accent markings and *fortissimo-piano* attacks in the solo bassoon line clearly project the equal dotted-eighth-note durations in spite of the changing surface rhythm, which includes the palindromic series <dotted eighth, sixteenth, eighth, eighth, sixteenth, dotted eighth> in bar 9. In retrospect, the dotted eighth notes in the harp in bars 2, 3, 5, and 7, which function as anacruses to the onsets in the initial measure voice, could be understood to prefigure the appearance of a dotted-eighth-note tactus because they are the only rhythmic feature of the first eight bars that does not fit into the triplet notation of the perceived meter.

No voice with durations longer than a dotted eighth note emerges strongly, but a measure voice in durations of three dotted eighth notes seems possible, especially if the material of the opening has created an expectation for triple meter. According to an interpretive strategy based on parallelism, this hearing would focus on the similarity between the contours of the first two groups of three accented pitches in the bassoon: the contour of the first sequence of three accented notes, <B♭3, C♭4, A3>, repeats in the next three accented pitches, <D4, F♭4, C♭4>, at a higher pitch level and with expanded
intervals. If this parallelism provides sufficient information for a listener to commit to a triple-meter schema, then the dotted-quarter-note duration between the bassoon’s sixth and seventh accented attacks can be heard as a syncopation, with an inferred accent substituting for the missing third onset in the measure voice. The note in the solo with the strongest dynamic accent, the final B♭3 (near the beginning of bar 11), would thus fall on the downbeat of the fourth perceived measure. This interpretation illustrates a case in which grouping contributes to the determination of a rhythmic voice, because the first two measure onsets depend on group beginnings instead of the conflicting contour and agogic accents.

Although the English horn solo stopped just when the new voices entered, its second phrase begins in time with the original meter after two tactus durations of five triplet eighth notes, joined by accompaniment in the harp that closely resembles the opening piano part. There is thus a brief period of disjunction between the meters in the first and second sets of voices, beginning with concurrent onsets on the downbeat of bar 9 and ending with nearly simultaneous attacks in the two tactus voices on the third triplet eighth note and fourth sixteenth note of bar 11. At this point the new voices shift to a third meter that persists from bar 11 to bar 15 in disjunction with the original meter (see Example 10). The piano line that projects the new meter again relies on isochronous onsets to create a tactus voice with a period of five sixteenth notes, and on contour, articulation, and dynamics to suggest a measure voice with onsets every four beats. Doubling in the rest of the orchestra is split between the two concurrent meters and distinguished by timbre. A pattern of 2, 1, 1, and 0 additional onsets in string harmonics reinforces the four respective beat classes in the new quadruple meter, and two additional
onsets in the harp and vibraphone double only beat class 1 of the continuing triple meter. The quadruple meter thus has a non-isochronous voice (voice 4 in Example 10) with onsets on the first, second, and third beat classes, while accents of registral density no longer articulate an intermediate, non-isochronous voice in the triple meter.

We can describe the synchronization of the two sets of voices in terms of the two types of non-coincident relationships between isochronous voices. The two tactus voices (voices 2 and 3) stand in a $T \frac{4}{3}$ relationship, with coincident onsets on the downbeat of every measure of triple meter. The two measure voices (voices 1 and 5), on the other hand, have the same duration between successive onsets and are related by $D \frac{1}{2}$. The disjunction between the meters in bars 11 to 15 therefore involves both irreducible tempo relationships and displacement relationships, as if simultaneous triple and quadruple meters with measures of equal duration have been offset by half of this duration.

Considering the difficulty involved in attending to multiple conflicting stimuli at the same time, it seems likely that in many instances of disjunction between two different meters, listeners will devote more attention to one meter rather than perceiving both equally. In this particular passage, the voices in the original triple meter could be heard as primary, because the melody participates in these voices and the only coincidence of onsets between the two meters reinforces the triple measure.

Later in the second *Invention*, after several other superimpositions of two meters, the number of clearly articulated voices decreases and the isochrony of onsets within individual voices begins to break down. Example 11 traces these developments through the succession of pizzicato, *quasi chitarra* chords in the violin and viola parts from bars 27 to 33, which contributes to two disjunct voices in the same manner as the woodwinds
Example 11. Rhythmic voicing in George Benjamin, second *Invention*, violins and violas, bb. 27-33.
in Example 7. In the first two bars of the excerpt, accent markings in the series of sixteenth-note onsets and points where the line passes from one part to another sustain a voice with isochronous, five-sixteenth-note durations (voice 1). This voice has been present in the texture for some time, and it receives support from attacks in the piano, low strings, and bass clarinet. However, the five-sixteenth-note voice is no longer linked to a slower, isochronous measure voice, and occasional sixteenth-note triplets break up its faster sixteenth-note subdivision. The presence of another voice in the upper string parts in disjunction with voice 1 offers an explanation for the triplets, because changes in the chord’s pitches occur every five triplet eighth notes, and the sixteenth notes must switch to triplet sixteenth notes at most of these chord changes in order for them to occur at the right moments. The melody and accompaniment in the woodwinds and horns in this section also participate in the chord-change voice (voice 2), and articulate additional, coordinated voices that continue to suggest a hierarchical triple meter.

Bars 27 and 28 thus resemble the earlier instance of disjunction in Example 10 in that they feature the same $T_4^3$ relationship, notated with the same note values and with greater focus on the triple meter in the overall texture. After the coincidence of the two voices on the third quarter note of bar 28 completes the first cycle of the four-against-three pattern, however, the durations in voice 1 begin to lengthen, throwing off the stable pattern of the irreducible tempo relationship between the two voices. In the passage shown in Example 11, the durations between onsets first increase by one sixteenth note, such that bars 29 to 30 contain three successive dotted-quarter-note durations in the voice in question, and then by another sixteenth note for three double-dotted-quarter-note intervals in bars 31 to 32. Starting with the return to a dotted-quarter duration in bars 32
to 33, voice 1 becomes entirely non-isochronous, with a different duration between every successive pair of onsets in a process of lengthening durations that continues for a large portion of the piece. Meanwhile, voice 2 remains isochronous, with only a slight deviation at the beginning of bar 32. Here, the first onset in voice 2 should come on the downbeat of bar 32 (and it does in the other parts that contribute to this voice), but instead the chord arrives an eighth note late, at the same time as an onset in the non-isochronous voice. The onset of the following chord change is back on track with its previous series of isochronous attacks and with the rest of the ensemble.

The departures from isochrony in this passage can be understood as distortions of conventional meter. The anomaly in voice 2 in bar 32 is a small detail, but it shows how distortion could appear in the context of an established meter. On the other hand, with its lengthening durations, voice 1 does not resemble a hierarchical meter, but it has a clear connection to a meter from earlier in the piece. After serving as the focal layer of periodicity in a series of several meters up to this point, in bar 27 voice 1 sheds its coordinated voices and then transitions to non-isochrony. The characteristics that determined onsets in the earlier meter—dynamics, notated accents, timbre, and doubling—continue to function in the same manner as the meter is reduced to a single voice and as the voice’s onsets become irregular, and to the extent that we persist in interpreting these rhythms with their previous triple-meter schema, we can continue to identify onsets in this voice and recognize it as a distortion of the original metrical entity.

3.3 Form in the Second Invention

As in Examples 10 and 11, disjunct voices throughout the piece divide into two sets of coordinated voices, sometimes making up two concurrent hierarchical meters, and
sometimes involving less synchronization in one or both sets. Figure 7 maps the tactus and measure voices over the course of the *Invention*. In order to specify exactly when the onsets in disjunct voices occur in relation to one another, Figure 7 labels voice onsets with reference to an imaginary stream of isochronous triplet-thirty-second-note onsets that are numbered with integers beginning on 0. The numbers become very high by the end of the piece, but the triplet thirty-second note is the largest rhythmic value that allows for the use of integers in measuring the duration between any pair of onsets in the rhythmic texture. This baseline pulse has no connection with the aural experience of the music other than as a general index of the maximum rhythmic complexity in a work.

Assuming the same relationship between notated durations and tempo as in the *Invention*, the common durational value in a piece with isochronous voices and without metrical dissonance or rhythmic polyphony could be as large as the eighth note or quarter note, whereas in a piece examined below, Adès’s *Piano Quintet*, the changing durations within rhythmic voices and the many disjunctions between voices make such a common value impossibly small for practical use.

Each onset in Figure 7 is represented by the number of the triplet thirty-second note with which it coincides. Thus, for example, the first three onsets in the opening tactus voice fall on triplet thirty-second notes 0, 20, and 40. As in Figure 6, disjunct sets of voices appear on opposite sides of a continuous horizontal line, with short vertical lines signaling simultaneous onsets. According to a conception and representation of listener attention to meter that resembles Yorgason’s (2008, 3-4) “path of metric focus,” bold type indicates onsets in a measure voice that emerge as the probable focus of the

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24 Forte’s (1980, 91) proportional graphs and attack-release partitions of rhythms in the music of Webern employ a similar method for comparing durations.
Figure 7. Map of onsets in tactus and measure voices in George Benjamin, second Invention.

Notated measure: \( \frac{1}{pno.} \)

<table>
<thead>
<tr>
<th>Measure: 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pno.</td>
<td>0</td>
<td>60</td>
<td>120</td>
<td>180</td>
<td>240</td>
<td>300</td>
<td>(320)</td>
<td>340</td>
<td></td>
</tr>
</tbody>
</table>

Rhythmic voices

<table>
<thead>
<tr>
<th>Tactus: 0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>140</th>
<th>160</th>
<th>180</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure: 0</td>
<td>60</td>
<td>120</td>
<td>180</td>
<td>240</td>
<td>300</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tempo change, \( I = 0.75 \)
Figure 7 continued.

Notated measure: 37 \( \text{Vc.} \) 39 \( \text{Vln.} \) 41 \( \text{E.H.} \) 43 \( \text{Vc.} \) 45

Measure:

Rhythmic voices

Tactus: 1358 1380 1406 1430 1461 1486 1514 1545 1584 1617

Tactus: 1350 1370 1390 1410 1430 1450 1470 1490 1510 1530 1550 1570 1590 1610 1634 1658

Measure:

Vln.

\[ \begin{array}{ccccccccccccc}
47 & 49 & 51 & 53 & 55 \\
\end{array} \]

\text{Cl.} \text{1800}

\text{tempo change, accel. al fine}

1682 1710 1740 voices merge

57 59 61

2070 2160

2070 2100 2130 2160 2190 2220 2232

\text{voice splits} \text{Vln.}

\text{voice merge}
listener’s metrical attention, either because there is no competing measure voice or because the voice is reinforced by the coincidence of onsets in disjunct voices. Onsets enclosed in parentheses are not sounded, but result from inferred accents based on the surrounding pattern of isochronous onsets in the same voice.

The timeline of rhythmic voices in Figure 7 could support detailed study of features including polyrhythmic synchronization and sectional proportions, but for present purposes it will provide an overview of metrical process and form in the second Invention. The form consists of three main parts, which can be understood in terms of recurring and changing metrical structures, motivic content, and the procedures of simple allusion, disjunction, and distortion. As we saw in Examples 8 to 10, the work opens with an allusion to triple meter in the first eight bars, which splits into disjunction by adding a much faster voice in bars 9 to 11 and then a quadruple meter in bars 11 through 15. At bar 16, the tempo slows to three-quarters of its original speed, meaning that the notated duration of the faster tactus voice in bars 11 to 15, five sixteenth notes, takes on the same sounding duration as five triplet eighth notes prior to bar 16. Thus, the tactus and measure voices of the opening triple meter effectively continue after bar 16 at the same rate in spite of the change in notation, while the $T_{\frac{4}{3}}$ relationship between the two tactus voices resumes at a slower speed with the entry of the viola duet in bar 17. Instead of the displacement relationship between the measure voices that occurred in bars 11 to 15, here the disjunction between two triple meters results in a large-scale $T_{\frac{4}{3}}$ relationship.

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25 In its organization into two sets of rhythmic voices that contribute to the articulation of form through their changing relationship, the second Invention resembles duets by Elliott Carter such as Enchanted Preludes and Esprit Rude/Esprit Doux, and the style of representation in Figure 7 could be effective for supporting analyses like Roeder’s (2006a, 394-9) narration of rhythmic interaction in Enchanted Preludes.
A complete cycle of this pattern spans the five notated \( \frac{3}{4} \) bars from the downbeat of bar 19 (triplet thirty-second note 690) to the downbeat of bar 24 (triplet thirty-second note 870). As indicated by the onsets in parentheses at the end of the second line in Figure 7, attacks continuing the faster triple meter are temporarily absent until the notated downbeat of bar 19, and a voice with eighth-note durations interrupts this meter in bar 24 as soon as the \( T_{\frac{4}{3}} \) cycle between measure voices concludes. Like the superimposed ostinatos that Horlacher (1992) observes in the music of Stravinsky, the cycle of the irreducible tempo relationship thus serves as an underlying structure that delineates this local section of the piece.

Comparing this passage with the prior instance of disjunction in bars 12 to 16 (triplet thirty-second notes 420 to 600), we find that the same notated span of 15 quarter notes (180 triplet thirty-second notes) elapses between its first and last coincident onsets. However, the two local sections differ in both tempo and motivic material, from an English horn solo with bell-tone accompaniment to a viola duet with staccato onsets in the basses and euphonium, suggesting that bar 16 begins a new large-scale unit within the first part of the piece. Table 1 summarizes the work’s metrical form, showing bars 1 to 15 and 16 to 26 as two roughly parallel, unequal halves of the first section. The bassoon’s intrusion in bar 24 reinforces this hearing of bars 16 to 26 as a varied repetition of the first sixteen bars because of its metrical and motivic similarity to the initial bassoon entrance in bar 9. The English horn solo also returns during bars 22 to 26, alongside the newer motives in the violas and basses, but this time it alternates between the two disjunct tactus voices, reinforcing onsets in the five-quarter-note voice in bar 22,
Table 1. Metrical form in George Benjamin, second *Invention*.

<table>
<thead>
<tr>
<th>Bars</th>
<th>Durations in Tactus Voices, in Triplet 32(^{nd}) Notes</th>
<th>Non-Coincident Relationship</th>
<th>Meters</th>
<th>Type of Allusion</th>
<th>Relative Tension Value</th>
<th>Local Section</th>
<th>Large-Scale Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-8</td>
<td>20</td>
<td>none</td>
<td>triple</td>
<td>simple</td>
<td>0</td>
<td>a(_1)</td>
<td>1.1</td>
</tr>
<tr>
<td>9-11</td>
<td>9, 20</td>
<td>T</td>
<td>triple</td>
<td>disjunction</td>
<td>2</td>
<td>b(_1)</td>
<td></td>
</tr>
<tr>
<td>11-15</td>
<td>20, 15</td>
<td>(T_\frac{4}{5}, D_\frac{1}{5})</td>
<td>triple, quadruple</td>
<td>disjunction</td>
<td></td>
<td>a(_2)</td>
<td></td>
</tr>
<tr>
<td>16-23</td>
<td>20, 15</td>
<td>(T_\frac{4}{5})</td>
<td>triple</td>
<td>disjunction</td>
<td></td>
<td>a(_3)</td>
<td>1.2</td>
</tr>
<tr>
<td>24</td>
<td>6, 20</td>
<td>T</td>
<td>triple</td>
<td>disjunction</td>
<td></td>
<td>b(_2)</td>
<td></td>
</tr>
<tr>
<td>25-26</td>
<td>20, 15</td>
<td>(T_\frac{4}{5})</td>
<td>triple</td>
<td>disjunction</td>
<td></td>
<td>a(_4)</td>
<td></td>
</tr>
<tr>
<td>27-35</td>
<td>20, (\sim 20)</td>
<td>(\sim D_\frac{1}{5})</td>
<td>triple, none</td>
<td>distortion</td>
<td>3</td>
<td>c(_1)</td>
<td>2</td>
</tr>
<tr>
<td>35-38</td>
<td>20, (\sim 20)</td>
<td>(\sim D_\frac{1}{5})</td>
<td>none</td>
<td>distortion</td>
<td></td>
<td>c(_2)</td>
<td></td>
</tr>
<tr>
<td>38-47</td>
<td>20, variable</td>
<td>changing</td>
<td>none</td>
<td>distortion</td>
<td>4</td>
<td>c(_3)</td>
<td></td>
</tr>
<tr>
<td>47-56</td>
<td>30</td>
<td>none</td>
<td>triple</td>
<td>simple</td>
<td>1</td>
<td>a(_5)</td>
<td>3</td>
</tr>
<tr>
<td>57-60</td>
<td>30, 18, 12</td>
<td>T</td>
<td>triple</td>
<td>disjunction</td>
<td></td>
<td>b(_3)</td>
<td></td>
</tr>
<tr>
<td>61-62</td>
<td>30</td>
<td>none</td>
<td>triple</td>
<td>simple</td>
<td></td>
<td>a(_6)</td>
<td></td>
</tr>
</tbody>
</table>
switching to the five-triplet-eighth-note voice in bars 23 and 24, and then going back and forth again in bars 25 and 26.

Because the non-coincident onsets in the irreducible tempo relationships and displacement relationship in bars 9 to 26 represent greater deviation from a triple-meter schema than the unusual quintuple subdivisions in bars 1 to 8, the succession of simple allusion and disjunction in the first part of the piece represents a change from a state of metaphorical metrical relaxation to a level of greater tension. Since there was an increase in tension between the first two passages of allusion, the preference for interpreting successive deviant passages as repeating the same change in deviation suggests that the distortion in the middle section will be heard as a further increase in tension. As we saw in Example 11, the faster tactus voice loses its hierarchical support in bar 27 and displays gradually lengthening durations between onsets. The slower tactus voice (shown below the dividing line in the fourth row of Figure 7) continues to articulate isochronous durations of five triplet eighth notes, but by bar 33 its coordinated measure voice has dissolved.

Example 12 provides an excerpt of the melody that articulates the slower tactus voice in bars 32 to 35. Beginning as a duet in English horn and bassoon that then transfers to the two cellos, this line strongly projects isochronous onsets, with a similar pattern of pitches and rhythms during each duration. The isochrony and motivic consistency, as well as the preceding coordination of this isochronous voice with a measure voice, will likely encourage a listener to hear the duet with reference to conventional meter. However, no higher-level accentuation or motivic parallelism emerges to confirm a particular metrical schema: every onset has the same notated accent
and fortississimo dynamic, and the slight variations in anacrustic rhythms, pitch height, and pitch intervals between parts do not suggest grouping into either twos or threes. The metrical ambiguity of this passage, creating but failing to confirm an expectation for hierarchical coordination, represents greater deviation from a conventional meter than if such hierarchical coordination were realized, thereby adding to the tension of the unequal durations in the other main voice.

In spite of its changing durations, at first the non-isochronous voice holds to roughly the same tempo as the isochronous voice; in fact, the average length of the first 15 non-isochronous durations (triplet thirty-second notes 1080 to 1380) is exactly 20 triplet thirty-second notes, the same duration as in the isochronous voice. Furthermore, the two voices appear to sustain two successive patterns that suggest displacement relationships: from triplet thirty-second notes 1110 to 1290, each non-isochronous onset falls an average of 5 to 6 triplet thirty-second notes after an onset in the isochronous voice, for an inexact version of a D1/4 relationship, and from triplet thirty-second notes 1290 to 1390, non-isochronous onsets average between 9 and 10 triplet thirty-seconds after the previous isochronous onset, suggesting a D1/2 relationship. Thus, an approximation of stable relationships between voices still underlies the beginning of the section of distortion.26

Durations in the non-isochronous voice increase with more variability from triplet thirty-second notes 1380 to 1740, and the isochronous voice finally departs from perfect regularity of onsets between triplet thirty-second notes 1610 and 1740. At triplet thirty-

26 These approximate displacements bring to mind the irregularity that Benjamin’s compatriot Harrison Birtwistle often introduces into repeated patterns such as ostinatos and pulse streams (Adlington 2000, 127).
second note 1740 (just before the downbeat of bar 48), though, the two voices converge and lock into a triple meter with tactus durations of five eighth notes. A solo clarinet carries the meter-defining melody in this final section, and in fact, the clarinet has been sustaining the D♯5 on which this melody begins, as quietly as possible, for the entire time since the beginning of the middle section on the downbeat of bar 27. Likewise, in retrospect the lengthening durations in the two voices of the middle section effect a transition to the longer durations between onsets in the meter of the ending section, with the non-isochronous voice changing over a long period of time, overshooting the target duration, and then returning to meet the isochronous voice, which remains constant until making a direct, smooth correction from intervals of 20 triplet thirty-second notes to 30. Since the previous change from disjunction to distortion was interpreted as an increase in deviation, the appearance of non-isochrony in both voices instead of only one suggests a further increase, while the sudden return of simple allusion marks a significant decrease in deviation. Thus, just as the gradually increasing contrametrical tension reaches its highest point, it gives way rapidly but logically to a much more relaxed state, so that tension and relaxation follow a contour of \(<0 2 3 4 1>\) over the course of the movement.

The last section returns to a single allusion to triple meter, which persists for three long measures and then accelerates to the conclusion of the movement, embellished by the succession of two faster disjunct voices in bars 57 to 61. Considering that the opening English horn solo (bars 3 to 8) and the spans of disjunction in the first section compared earlier (bars 12 to 15 and 19 to 23) also each consist of three measures in the prevailing set of coordinated voices, we might argue that Benjamin’s model for the

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27 Bruce (1995, 582) also makes this observation.
conventional triple meter in the piece extends conceptually one level deeper than the measure voice, acting as a framework that structures several local sections of the music. Analysis of rhythmic voicing thus allows us to describe rhythmic features of the second Invention in relation to a schema for a conventional triple meter, as well as to demonstrate how the different forms of metrical allusion and changes between them constitute one of the main dimensions organizing the form of the work.
Chapter 4: Analysis of Works by Thomas Adès

4.1 Metrical Allusion and Musical Reference

After studying composition at King’s College, Cambridge, with Alexander Goehr and Robin Holloway, Thomas Adès (b. 1971) quickly earned an international reputation as an extraordinarily talented composer, winning the Grawemeyer Award before the age of 30 (Schweitzer 2008; Taruskin 1999). Among of the most evident characteristics of Adès’s work are its references to other music from a variety of different styles, eras, and composers. Taruskin (1999) labels this eclecticism “surreal” rather than postmodern, and Whittall (2003, 5-6) considers enjoyment to be the motivation for Adès’s allusions, not an oppressive Bloomian “anxiety of influence.”

In schematic terms, we might define reference in a musical work as the activation of the schema for a particular style, genre, or piece that was learned in a musical context distinct from the present work’s context. The components of this schema will typically be features associated with the referential style, genre, or piece from several different musical parameters, including meter. Metrical allusion can thus act as a mutually reinforcing component of a musical reference, wherein the activation of the metrical schema associated with a given style, genre, or piece encourages a listener to hear the music with reference to this category, and conversely, recognizing the reference reinforces the application of the associated metrical schema. Many of Adès’s references employ metrical allusion in this way, as, for instance, in the clear evocations of the tango genre that Roeder (2006b) identifies in the overture to the opera Powder Her Face, op. 14 (1995), and the fourth movement of Adès’s string quartet, Arcadiana, op. 12 (1994). The references in both pieces are anchored by rhythmic ostinatos, excerpted in Example 13,
**Example 13.** Metrical allusion in Adès's references to the tango genre.

a. *Powder Her Face*, overture, lower staff of piano score, bb. 57-60.
Example 13 continued.


\[ \frac{\text{tactus}}{\text{measure}} \] 4

1Onsets on the second and fourth beat classes that are not shown as resulting from inferred accents are articulated by the violins.
that closely resemble the characteristic accompanimental rhythms of the tango (Béhague 2001, 73). These rhythms and the hierarchical meter to which they allude contribute significantly to the activation of the tango schema, alongside features of other parameters such as consistent patterns of pitch contour in the ostinato and hints of functional triadic harmony (Roeder 2006b, 132-5) as well as the prominent accordion in *Powder Her Face*. The schema that allows a listener to recognize the tango reference operates in the same manner as a metrical schema, leading the listener to expect new musical information to continue to fit the patterns of the popular dance genre. The metrical schema in Example 13 thus persists more strongly than it would without the tango reference, even in the face of incompatible rhythms in the melody or departures from the ostinato rhythm. For instance, Roeder (2006b, 133-4) shows how rhythms other than the strict <dotted quarter, eighth, quarter, quarter> figure in *Powder Her Face* are readily understood as metrical distortions that elide the ending of one measure with the beginning of the next or modify the durations within a measure.\(^{28}\)

Adès’s music also contains metrical allusions that, like those in *Sudden Time* and the second *Invention*, are not so closely tied to musical references. The second movement of the acclaimed symphonic work *Asyla*, for example, opens with an allusion to triple meter in an ensemble of cowbells, two pianos (the second tuned a quarter-tone flat), celesta, and harp (see Example 14). The basis of the rhythmic material on alternating half-note and quarter-note durations is clearly audible, but grace notes and the admixture of onsets on triple and quintuple divisions of the quarter note embellish the

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\(^{28}\) Even the undistorted ostinatos shown in Example 13 depart from condition (3) for non-isochronous voices in conventional meter, subtly marking the meter as an allusion rather than a true conventional meter.
Example 14 continued.

measure 3

tactus 4

elongated anacrusis

Bass Oboe

mf molto cantabile, expr.

Cowbells

Piano 1

Upright

Harp

Example 14 continued.
simple pattern. In particular, none of the onsets in the out-of-tune Piano 2 coincide with rhythmic-voice onsets, linking rhythmic and pitch distortion. The ostinato continues with the entry of a solo bass oboe, which presents a compound melody of interlocking chromatic, octatonic, and hexatonic collections in sequences of three registrally separated descending semitones (Roeder 2006b, 127). The percussion ensemble has already repeated several times a semitonal descent from upbeat to downbeat, and the appearance of the bass oboe’s first note as an elongated anacrusis in bar 11 further encourages us to hear descending semitones in the new melody as upbeat-downbeat motion.\(^{29}\) Since each phrase, as defined by melodic contour, contains three descending semitones, all in quarter notes, the melody suggests its own slow triple meter that stands in a \(T\frac{3}{2}\) relationship with the initial triple meter. Both the anacrusis and downbeat onsets coincide at the beginning of each bass oboe measure, highlighting the periodic realignment in this typical hemiola pattern. Melodic material in much of the second movement of \textit{Asyla} derives from variations on the bass oboe’s melody, calling to mind the descending semitones and passacaglia treatment of Ligeti’s “Lamento motif,”\(^{30}\) and suggestions of triple meter are also latent throughout despite frequent distortion and disjunction. However, since triple meter is not a particular characteristic of the Lamento, the metrical allusion does not have the same kind of reinforcement with respect to the musical reference as in the tango examples even if we hear a strong association with Ligeti.

\(^{29}\) Note that, since it lasts for three triplet eighth notes, the triplet dotted quarter note in voice 1 in bar 11 has the same duration as a regular quarter note in the surrounding bars.

\(^{30}\) See Taylor (1994) for a description of the Lamento motif and analyses of its use in several works.

a. Original passage
Example 15 continued.

b. Metrically normalized recomposition. Small note values above most notes indicate the amount and direction that each idealized duration must be altered to produce the corresponding duration in Ex. 15a.
The passage excerpted in Example 15a illustrates an allusion to triple meter from later in the movement. Here, the timbre of the increasingly *espressivo* string section and the use of triadic harmonies that sound like they could be on the verge of confirming a tonal center suggest a Romantic orchestral idiom. The melody in the cellos is quite different from the original theme, but it still features an overall descending contour with prominent half steps, as well as descending chromatic motion in the accompanying second violins and violas. Divisi first violins play the same melody and two-part accompaniment beginning almost a bar later, transposed by 8 semitones in pitch-class space. As in the opening percussion passage, entries on triple, quadruple, and quintuple subdivisions of the quarter note distort the exact durations in multiple parts; however, here the distortion causes a departure from the quarter-note and bar durations instead of only blurring the details of ensemble coordination. Thus, the displacement of the first violins from the rest of the strings does not realize a strict canon because the variations in quarter-note and bar length prevent the establishment of a consistent proportion between corresponding durations in the two groups.

Despite the rhythmic complexity and instability of the passage, it remains remarkably close to a triple-meter schema. Example 15b adjusts the rhythms to match conventionally aligned voices moving in quarter notes in triple meter, offering one possibility for the specific metrical organization that a listener might hear as underlying the actual durations and their coordination. The small note values accompanied by + and – signs above most durations in the recomposition indicate the size and direction of the actual duration’s deviation from this idealized version, so, for instance, the– sign and triplet eighth note above the note in the cello part on the downbeat of the third bar mean
that the corresponding duration in Example 15a subtracts a triplet eighth note from the half note of Example 15b. The magnitudes of almost all of these alterations are less than an eighth note, and similarly, the nearly simultaneous onsets that Example 15b aligns usually fall within the duration of an eighth note. For example, attacks in the first violins a triplet quarter note before the downbeat of bar 55, in the second violins and cellos an eighth note before the downbeat, and in the violas a sixteenth note before the downbeat are all normalized to the downbeat of the fourth bar in Example 15b.

Distortions of the durations in Example 15b follow two general patterns. Especially near the beginning of the excerpt, series of several distortions in a single part often cancel one another out, in the sense that a distortion in one direction is balanced by another distortion of the same magnitude in the other direction. For example, the first duration in the viola part is one triplet eighth note shorter than a dotted half note, and the second viola duration is a triplet eighth note longer than a dotted half, so the third onset arrives exactly in time, on the downbeat of the third measure. Similarly, the first three durations in the first two of the divided violin I parts are each short by a triplet sixteenth note, and the fourth duration is long by an eighth note, balancing the sum of those three distortions.\footnote{Particularly in cases of balancing, the adjustment of durations in Example 15b resembles Roeder’s (2006b, 123-4) analysis of “quasi-meter.”} This equalization of durational alterations resembles the model of Romantic rubato for which Epstein (1995, 371-415) offers empirical evidence. Not all durational distortions are exactly balanced, however; there is a clear overall trend toward shortening the idealized durations. If, as Example 15b proposes, we hear these shortening durations in the context of a stable meter, then they can be interpreted as an
accelerando.\footnote{32} As a metrical allusion, the music thus suggests an accelerando, played with rubato, that is intensified by the independence of timing among instrumental parts. The salience of the schematic metrical background and the tension of this deviation from it combine with numerous other factors, including the similarity with metrical phenomena earlier in the piece, the lament affect associated with chromatic descent, and the reference to Romanticism, to make this one of the more poignant passages in the movement.

4.2 Metrical Allusion in the Second Theme of the Piano Quintet

In the score to the Piano Quintet, op. 20 (2001), unusual features of Adès’s technique for notating bars facilitate further development of the type of nuances in divergent durations examined in Example 15. First, the frequently changing time signatures incorporate a wide range of novel denominators, adding 5, 6, 7, 9, 10, 12, 14, and 24 to the usual repertoire of 4, 8, and 16. To conceptualize the durations that these unfamiliar time signatures indicate, we can take literally the conventional North American names of note durations: if a quarter note is so-called because it lasts for one-quarter of the duration of a whole note, then its notational equivalent (a note with a solid notehead and a stem without flags or beams) in a bar of \( \frac{3}{5} \) must be a “fifth note,” which lasts for one-fifth of a whole note. The duration of a fifth note can also be expressed in a \( \frac{4}{4} \) bar within a tuplet showing that five quarter notes occupy the time that four quarters would normally take, but the new time signatures allow Adès to depart from the limitations on numbers of durations that tuplet notation imposes (e.g., there must be five quintuplet quarter notes to fill a \( \frac{4}{4} \) bar).

\footnote{32} Hasty (1997, 275-7) describes this phenomenon of notated accelerando in Babbitt’s music.
Further complicating the notation of the Piano Quintet is the fact that bars with different time signatures and durations often occur simultaneously in different parts, so that the barlines do not coincide. Most commonly, the ensemble divides into two groups, strings and piano, with bars that are out of sync with each other, but there are also moments when all five parts have different time signatures and misaligned barlines. For example, near the beginning of the first system on page 23 of the score, the bars of $\frac{3}{4}$ in the first violin, $\frac{1}{6}$ in the second violin, $\frac{4}{6}$ in the viola, $\frac{4}{5}$ in the cello, and $\frac{4}{4}$ in the piano all begin and end at different times.

Adès’s non-standard notation is not completely new. A precedent of particular interest is the music of Brian Ferneyhough, who began to incorporate the same kind of time signatures in the early 1980s (Fox 2004, 52); for example, Superscriptio (1981) employs the denominators 10, 12, and 24, as well as others that do not occur in the Piano Quintet including 20, 40, and 48. What makes Adès’s time signatures striking is their use in a work that evokes nineteenth-century organicism more strongly than twentieth-century modernism. Whereas Ferneyhough seeks “to free [rhythmic structuring] from the lingering residues of superseded affective vocabularies and general over-reliance on the more commonplace aspects of speech-resemblance” (Ferneyhough 1995, 51), Adès states that “in the Quintet, [he] really wanted to get a structure that would unfold at a sort of Classical rate but also contain complex metrical processes” (Adès 2001, 28). Along with frequent use of triadic harmonies, Adès’s treatment of pitch motives seems more Beethovenian than Webernian, and the organization of recurring thematic content in the single-movement piece creates a form that bears more than a passing resemblance to a sonata. In discussing the content of the Quintet, Adès (2001, 28-9) cites diminished
seventh chords in Berlioz’s *The Trojans* and themes in Beethoven’s Piano Sonata, op. 28, as inspirations for the material. As Fox (2004, 47) points out, however, perhaps the strongest reference in the *Piano Quintet* as a whole is to Brahms, especially in light of Adès’s next opus, a setting of Alfred Brendel’s irreverent poem “Brahms” about the ghost of the composer. With regard to sonata form, the work’s motivic content suggests a sequence of first, second, and closing themes, and cycles through these themes divide the piece into the large-scale sections of an exposition, development, recapitulation, and coda. Adès (2001, 28) uses these four terms in referring to the sections of the work, and the reference is unmistakable, especially with the exact repetition of the exposition. The following analysis further explores this sonata reference, but it is important to note that, considering the absence of other defining features of sonata form such as functional tonality, the work no more conforms to a conventional sonata form than its rhythms conform to conventional meter. Even the treatment of thematic material does not always meet the expectations for a sonata, and some of the boundaries between theme groups are not perfectly clear.

Rhythmic voicing in the *Piano Quintet* does not display the same degree of continuity as in Benjamin’s second *Invention*. Rhythmic voices occasionally create links between sections of the piece, such as when three different sets of coordinated, isochronous voices moving at different tempos converge on the downbeat of rehearsal 19 to initiate the recapitulation (see the second system on p. 29 of the score). For the most part, though, sets of voices are limited to sections, usually delineated by rehearsal numbers, that begin with synchronization and rapidly diverge into complex patterns of disjunction and distortion, only to be interrupted and “reset” at the beginning of the next
section in the same kind of process that McManus (2009, 17) observes in the first movement of Asyla. The intra-opus unity of Adès’s rhythmic materials depends more heavily on parallelism among passages with similar content that occur at different times in the piece than on the transformations of voices in direct succession that Chapter 3 identifies in Benjamin’s music. Thus, instead of tracing an unbroken rhythmic series during the work, I compare metrical allusion in statements of material that belongs to the second theme group according to the work’s correspondence with the thematic structure of sonata form. The rhythmic voicing in this sequence of passages demonstrates how changing metrical allusion over the course of the movement articulates a pattern of tension in connection with the reference to a sonata.

Following the fugal first theme of the Piano Quintet, a transitional passage beginning at rehearsal 3 introduces two rhythmic motives that foreshadow the second theme (see Example 16). For most of the transition, the material in the strings follows a rhythmic ostinato notated in quintuplet eighth notes (or “tenth notes,” since the duration of a quintuplet eighth note is one-tenth of a whole note).33 The lengths of durations that separate the main onsets in the strings’ rhythm alternate between two and three tenth notes, forming a pattern similar to the alternation of half notes and quarter notes in Figure 1 but with a different rhythmic quality due to the ratio of 3:2 between the long and short durations instead of the 2:1 ratio in Figure 1. Pitch parallelism in the strings at rehearsal 3 suggests local partitioning into pairs of onsets in the same manner as Figure 1, with grouping partitions containing a short duration followed by a long duration, and complementary, offset accentual partitions in the opposite, long-short pairing. The

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33 Example 16 omits the piano part, which accompanies the strings with isochronous onsets at a different, slightly faster tempo.
persistence of this ostinato in the transition prepares a listener to hear subsequent, rhythmically complex passages in terms of such alternating, unequal durations with offset grouping and accentual partitioning. In line with the preceding analyses, my interpretations focus primarily on the long-short accentual partitions, even though short-long grouping is also salient.

The other second-theme motive in the transition is a single-bar incipit of the second theme itself (the third bar of Example 16; this bar is identical to the first bar in Example 17 except that all parts are one whole tone higher in the transitional version, and the dynamic marking is pp instead of p). This isolated figure dramatically interrupts the ostinato, opposing its homophonic short-long-short pattern to the preceding long-short rhythm, which resumes after the intrusion. The rhythmic contrast manifests not only in the partitioning into three durations instead of two, but also in a long-short ratio of 2:1 and a different tempo. Since the short durations in the ostinato last for one fifth note (i.e., two tenth notes) and the short durations in the bar from the second theme last for one sixth note, the interruption has a slightly faster tempo than the surrounding material in the strings.

The motivic material that is most distinctive of the second theme receives its first extended presentation immediately after the transition (see Example 17), and the beginning of this passage can be understood to synthesize the transition’s two contrasting rhythmic motives. Each of the first four bars in Example 17 repeats the short-long-short pattern, at its original sixth-note tempo in the first and third bars and at the slower fifth-note tempo of the rest of the transition in the second and fourth bars. In the fifth bar, however, alternation between long and short durations as in the transition’s main motive
supercedes the short-long-short rhythm, now with a 2:1 long-short ratio. The second half of Example 17 thus effectively combines characteristics from both initially opposed motives.

Although Example 17 is among the most durationally straightforward passages in the piece, in the sense that it is entirely homorhythmic, the rhythm seemingly defies understanding in terms of conventional meter. Since no two successive bars have time signatures with the same denominator, the duration attributed to the symbol with a filled, stemmed notehead (a quarter, fifth, sixth, or seventh note) changes slightly with every barline, so there are no uninterrupted isochronous voices. While it might be possible in other situations to employ time signatures with varying denominators to project isochronous durations, in this case neither bar lengths, actual rhythms, nor potential subdivisions entail equal durations beyond the boundaries of a single bar.\textsuperscript{34} The closest the excerpt comes to a recurring multi-bar duration is in the repetition of the first pair of bars, but the pattern dissolves after this single iteration.

Despite the absence of sustained isochrony, however, almost every bar contains a long-short rhythm in the ratio of 2:1, a feature that the notation with would-be half notes and quarter notes makes visually apparent. Especially if the emergence of the long-short motive in the fifth bar can be heard to make the presence of this rhythm in each of the first four bars more evident in retrospect, the repetition of this pattern will activate a triple-meter schema in the same way as in several of the excerpts analyzed above.

\textsuperscript{34} With regard to the possibility of very fast, equal subdivisions like those used in the analysis of the second Invention, the least common multiple of the time-signature denominators in this passage is 840, meaning that the longest duration that could be used to divide the entire time span into equal parts while articulating the downbeat of each measure is $\frac{1}{840}$ of a whole note—a duration far too short to be analytically useful, much less performatively or perceptually meaningful.
Characteristics of the context of conventional meter, including the use of triadic harmonies, stepwise voice leading, and the piano quintet instrumentation, reinforce the metrical schema, and this context also encourages listeners to interpret the fluctuations in tempo indicated by the changing time signatures with reference to expressive variation.

We can understand this allusion as introducing both distortion and disjunction into a referential isochronous meter in the ways outlined in Figure 8. Beginning with an idealized isochronous triple meter that Figure 8a notates in $\frac{3}{6}$, the tempos of individual measures are first increased or decreased to produce the distortion in Figure 8b. Almost all of these tempo fluctuations are expressed notationally as a change of the time-signature denominator by one increment, transforming the schematic measure of $\frac{3}{6}$ into a slower $\frac{3}{5}$ or a faster $\frac{3}{7}$. After effecting these changes, $\frac{3}{6}$ remains the most frequent time signature, and the addition of $\frac{3}{7}$ and then $\frac{3}{8}$ measures to the original alternation of $\frac{3}{6}$ and $\frac{3}{5}$ creates an overall impression of increasing tempo. Figure 8c then indicates the periodic displacement of the downbeat. Especially when this displacement corresponds to a change in timbre, as is the case with the four occurrences in this example, the sudden shift in the temporal placement of long and short durations suggests a change to a different stream of coordinated rhythmic voices.

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35 In this and several of the following figures, time signatures serve as a shorthand for a set of hierarchically coordinated rhythmic voices. Figure 8a thereby implies three rhythmic voices: the non-isochronous voice represented in the figure, and the isochronous quarter-note and dotted-half-note voices that flesh out a conventional meter.

36 According to the Quintet’s initial marked tempo of 88 quarter notes per minute, a change of one unit in the time-signature denominator always indicates a change of 22 beats per minute in the tempo of a measure. However, because the durations of bpm units vary proportionally with tempo, the absolute difference in tempo changes by a different amount in each case. Thus, the perceived difference between the tempos in a measure of $\frac{3}{6}$ and a measure of $\frac{3}{5}$ is not the same as the difference between measures of $\frac{3}{6}$ and $\frac{3}{7}$.
**Figure 8.** Transformations of a conventional meter to produce the rhythm of Example 17.
The displacement might be heard as implying disjunction between rhythmic voices in the sense of what Krebs (1999, 45) calls “indirect dissonance,” wherein a listener recognizes conflict between disjunct voices even though the voices actually sound in succession, not simultaneously. Each successive displacement results in an indirect $D \frac{1}{2}$ relationship, but if, in spite of the variations in tempo, we interpret the downbeat of the displacement with respect to the downbeat of the initial meter, there are three possible orientations of the shifted downbeats: on the initial downbeat, on the initial beat class 2, and on the initial beat class 3. Figure 8c labels these three options stream 1, stream 2, and stream 3; each set of voices in a single stream will be referred to as a segment, so Figure 8c contains five segments. Since there are only three streams, the third displacement shifts the downbeat back to its original orientation, and the majority of the measures are in phase with the initial downbeat. The last displacement, from stream 1 to stream 2, involves another distortion in addition to the tempo fluctuation and pulse-stream displacement, in which the anacrusis that initiates the final displacement is elongated to produce a single bar of $\frac{1}{5}$.

In spite of the interruptions and the frequently changing tempo, the transformations in Figure 8 illustrate the relationship of the non-isochronous rhythms with a conventional rhythmic texture, showing how we can still hear three coordinated, non-isochronous rhythmic voices in the passage. This account of allusion to a single, continuous conventional meter emphasizes the principle of parallelism, in that whenever the long-short rhythm occurs, it is always interpreted in the same way. Figure 8 thereby sticks to a single metrical schema, even when there occur successions of durations, such as the opening short-long-short rhythm, that might relate to other models. The rarity in
common-practice meter of changes in periodicity on the level of the notated bar partially justifies this reliance on parallelism, but listeners are certainly able to change to a different schema in response to changes in the music.

Furthermore, while Figure 8 proposes a metrical derivation of the rhythm in Example 17, it does not fully explain a listener’s metrical experience of the music. One example of another aspect of the meter relates to the fact, noted above, that the only trace of exact large-scale durational equality occurs through the repetition of the initial pair of notated $\frac{4}{6}$ and $\frac{4}{5}$ bars. Since not only the duration, but also the content of the bars is repeated almost exactly, the first four bars begin to establish the expectation that their characteristics—overlapping phrases defined by the alternation of instrumentation between the string quartet and piano (numbered in Example 16), with a stream shift at every phrase beginning—will continue to be repeated. The content of the fifth bar (and its anacrusis) thus denies expectations in several parameters; in particular, a switch of instrumentation occurs without a displacement of the downbeat. We can thus understand the sequence of metrical stream shifts to be in dialogue with the linked parameters of phrasing and instrumentation. The disruption of the initial correlation between stream shifts and instrumentation shifts affects metrical sensations during the second segment in stream 1 to the extent that a listener might even be surprised at the metrical continuity from the fourth to fifth and fifth to sixth phrases in the excerpt. Thus, a significant metrical change will be heard to occur at the beginning of the fifth bar, even according to an interpretation that relates all of Example 17 to a single metrical schema instead of analyzing the opening short-long-short motive as metrikally distinct.
Example 18 continued.
Example 18 continued.
Figure 9. Rhythmic reduction of the strings in Example 18.

First Phrase Group

Second Phrase Group

Stream 1: \( \frac{3}{6} \)
Stream 2: \( \frac{3}{5} \)
Stream 3: \( \frac{3}{6} \)

Antecedent

Consequent

progressively shorter measures = accelerando

Second Phrase Group

progressively shorter measures = accelerando

anacrusis lengthened

anacrusis lengthened

(Reprise of First Phrase Group)

intra-measure tempo fluctuation

7
Example 18 shows a variation of the theme from later in the exposition’s second-theme group. The strings begin the excerpt with almost exactly the same succession of chords as when the theme first appeared, and in spite of the difference in notation, each of the first three phrases of Example 17 is simply expanded by the repetition of its first anacrusis-downbeat group. In the same manner as Figure 8c, Figure 9 renotes and separates the string quartet’s time signatures and implicit disjunctions in Example 18. By following roughly the same sequence of tempo changes and adding another displacement at the end of the series, the rhythm in Figure 9 can be understood to extend the same pattern of distortion and disjunction as in the first excerpt. Since the piano has taken up new material, the instrumentation in the passage at Example 18 articulates phrases more subtly than in Example 17 through the alternate addition and subtraction of the first violin (often paired with the cello), and like the fourth segment in Figure 8c, the fourth and fifth segments in Figure 9 each span two phrases.

Similarities in melodic content further organize the short phrases in the section at rehearsal 6 into the two larger phrase groups marked with slurs on Figure 9, with the attainment of a higher register (G6) in the first violin and Adès’s instruction for dolcissimo playing signaling the beginning of the second phrase group. The first phrase group alternates between segments in $\frac{3}{6}$ and $\frac{3}{5}$, and the second develops several characteristics of Figure 8c. First, the elongated anacrusis that began the last segment in Figure 8c returns in the form of the $\frac{1}{4}$ bars that initiate each of the last two segments in Figure 9. Second, each segment in the second phrase group follows a pattern of acceleration that is shown as the succession of $\frac{3}{5}$, $\frac{3}{6}$, and $\frac{3}{7}$ bars, elaborating the tendency toward faster measures from the end of Example 17. A new feature at the very end of the
passage is the series of $\frac{1}{6}$, $\frac{1}{4}$, and $\frac{1}{6}$ bars, which departs from the long-short pattern by articulating all three beat classes in a measure. This change accommodates the introduction of a new kind of tempo fluctuation, an alteration of durations within a single measure that here takes the form of a shorter second duration in the tactus voice. The metrical character in the last measure of Figure 9 is further complicated by the fact that its last sixth note is the anacrusis that begins a slightly varied repetition of the entire passage at rehearsal 6. Since this last note, the notated downbeat of rehearsal 7, is thus exactly parallel to the first note in Figure 9 but it occurs in stream 3 instead of stream 1, the sense of unexpected metrical continuity occasioned by the articulation of a phrase without a downbeat displacement is stronger here, to the extent that a listener might even hear a shift back to stream 1 at rehearsal 7 despite the absence of a literal displacement.

While the string quartet plays the version of the original second theme analyzed in Figure 9, the piano adds two other distinct rhythmic voices, both adhering strictly to different ostinatos. The rhythm of the upper staff is a series of five triplet eighth notes and one regular eighth note; in the fractional time-signature terminology of the Quintet, this would be five twelfth notes and one eighth note. The longer duration of the sole eighth note is the element that separates the series from isochrony, and conceiving of this duration as an elongated twelfth note allows us to understand the pattern as arising from a continuous pattern of twelfth notes that would provide isochronous subdivisions for the strings’ theme in its referential $\frac{5}{6}$ meter.

As delineated by Adès’s phrase notations, the lower staff of the piano presents a different rhythmic series that is five quarter notes long, which we might divide into two halves, quarter-eighth-quarter and quarter-quarter-quarter, on the basis of the tenuto
Figure 10. Derivation from a $\frac{3}{6}$ meter of the rhythm on the lower piano staff in Example 18.
markings on its first and fourth onsets. Figure 10 illustrates a hypothetical derivation of this rhythm from an accompanimental pattern in $\frac{3}{8}$, whereby a two-measure rhythm in $\frac{3}{6}$ is first slowed down to $\frac{3}{4}$, and then its dotted quarter notes are shortened. As in the interpretation of the rhythm on the upper piano staff, the figure begins with a $\frac{3}{6}$ meter as the referential schema. The second adjustment increases the frequency of the 2:1 durational ratio and partly compensates for the increased measure duration that the change from $\frac{3}{6}$ to $\frac{3}{4}$ had introduced.

If the period of each of these series articulates a measure, then the measures on the upper staff last for $\frac{11}{24}$ of a whole note, and the two measures that bisect the lower staff’s rhythmic series are each $\frac{5}{8}$ of a whole note. These two measure lengths, which could be considered two different slow tempos (~40.6 bpm and 35.2 bpm based on the movement’s original tempo marking), are related by a ratio of 15:13. Hence, the two series establish a slow cycle of misalignment in which 15 measures of $\frac{11}{24}$ and 13 measures of $\frac{5}{8}$ must elapse before the between-staff onsets return to the same orientation (i.e., a T $\frac{15}{13}$ relationship). One iteration of this cycle takes place during the section at rehearsal 6, finishing just before the final displacement in the strings, at the first dotted vertical line between the piano staves on the same system as rehearsal 7 in Example 18.

The passage in Example 18 thus superimposes three independent, disjunct sets of rhythmic voices, each of which could be thought of as deviating in its own way from the $\frac{3}{6}$ model. These deviations are not coordinated: while the meter in the strings is frequently subject to tempo changes and downbeat displacements, the two sets of voices in the piano persist in their own fixed series, rapidly diverging from their initial orientation with respect to the strings’ downbeats and articulating a separate, large-scale
tempo relationship. Thus, in comparison with the first excerpt from the *Piano Quintet*, the passage at Example 18 exhibits a significant increase in the level of contrametrical tension in the setting of the second theme. The first statement of the second theme already possesses some tension in its tempo fluctuations and displacements of the downbeat, but the complicated disjunction added in Example 18 clearly augments the tension in this second instance.

A third version of the second-theme material follows directly at rehearsal 8. Shown in Example 19, this section resembles Example 18 in that it includes three disjunct sets of rhythmic voices. The first violin and the remaining strings now articulate two separate patterns, each of which suggests acceleration through switches to progressively faster series of isochronous onsets. The first violin initially moves in half notes, changes on the second system of Example 19 to triplet half notes (third notes), and continues beyond the excerpt with quarter notes. Switching its isochronous durations more frequently, the second violin passes through series of third notes, fifth notes, sixth notes, seventh notes, eighth notes, and tenth notes and then begins to reiterate the acceleration with a return to sixth notes near the end of the second system. A descending minor third in the viola and cello signals each change to the second violin’s durations, and these pairs of notes in the lower strings could be heard as an anacrusis-to-downbeat pattern that forms a slower measure voice. This voice is tenuous, however, because its durations are non-isochronous and the placement of its onsets varies with respect to changes of isochronous durations in the second violin—at the beginning of the second system of Example 19, for instance, the second onset of the first melodic dyad in the

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37 The first such punctuation, in the fourth bar after rehearsal 8, marks a displacement of the third notes instead of a faster tempo.
Example 19 continued.
viola and cello occurs on the last fifth-note onset before a switch to sixth notes, whereas the second onset in the next dyad coincides exactly with a switch to seventh notes.

The piano, meanwhile, has taken over the chordal melody of the second theme from the strings in the previous section. Like Benjamin’s rhythmic cues for the viola solo in *Sudden Time*, cues for the piano melody clarify that the notated quarter-note quintuplets in bars of $\frac{4}{4}$ are to be understood as fifth notes in $\frac{6}{5}$. Strikingly, this third version of the second theme removes the distortion and implied disjunction of Examples 17 and 18 for a true triple (or compound duple) meter, interrupted only by the elongated measure of $\frac{9}{5}$ at the end of the first phrase group. In tandem with this metrical familiarity, the piano’s functional, diatonic harmony in A major and symmetrical phrase structure are also significantly closer to common-practice conventions than the foregoing music. Although the accelerating, disjunct voices in the strings interfere with and eventually lead the music away from the conventional meter, at rehearsal 8 the strings’ simple, seemingly accompanimental pitch material in A major mitigates the conflict in a manner similar to the low perceived deviation demonstrated in Example 3b. The melodic $<$E, C#$>$ dyad in the viola and cello and subsequent fifth notes in the second violin at the end of the first system could even be heard to shadow the piano heterophonically, since the piano moves from E to C# at approximately the same time as the lower strings, and the second violin’s onsets are offset from those in the piano by only one-thirtieth of a whole note. Overall, then, in Example 19 the perceived deviation from conventional meter, and thus the metaphorical tension, is distinctly lower than in either of the first two presentations of the second-theme material.
Tension swings to the opposite extreme with another transformation of the second-theme material in the development. In the section from rehearsal 16 to the end of the first system on page 23, represented by Example 20, the piano part varies the same two repeating rhythms as in Example 18 by omitting some of the attacks. For instance, the tie between the third and fourth triplet eighth notes in the right hand in the first bar of Example 20 eliminates one of the onsets in stating the series of five twelfth notes and one eighth note, but this rhythmic series still clearly underlies the literal durations. The pitch content in the strings differs substantially from the theme’s previous chordal realization (see the discussion of the pitch-class dyad series below), but the first violin hints at the familiar melody by beginning with the same repetition of D6 and C♯6 as in the first bars of Example 18. Adès breaks up the previous homorhythm in the string quartet through the use of a different rotation of a single series of durations in each of the four instruments. For example, there are four bars in each string part between the downbeat of rehearsal 16 and the moment when the four barlines align near the end of the system. The first violin part is notated with bars of $\frac{4}{6}$, $\frac{2}{4}$, $\frac{4}{5}$, and $\frac{3}{5}$, and the cello has the same ordered series of bars with the same rhythms, except that it begins with the bar of $\frac{3}{5}$ and continues with $\frac{4}{6}$, $\frac{2}{4}$, and $\frac{4}{7}$. The rotation thus transfers the last duration of the first violin’s series to the beginning of the series that the cello plays, and the same procedure generates the other two parts such that all four possible rotations of the four notated bars occur simultaneously.

The rhythms in the string quartet during the entire section derive from the rotation of several longer durational series, as summarized in Figure 11. The rotational structure in the first four bars at rehearsal 16 arises within a longer series of rotated durations that
**Figure 11.** Rhythmic and pitch-class dyad series in the strings in the *Piano Quintet*, rehearsal 16 to the end of the first system on p. 23.

*Durations are shown as fractions of a whole note, and pitch classes are labeled as numbers from 0 to 11 with C as 0 and “t” and “e” for 10 and 11. Unordered dyads within pitch-class series are always sounded simultaneously. Referential orderings of the series are taken from the first violin part, with the exception of pc series β. The operation \(\text{rot}_n\) shifts elements in a given series \(n\) order positions to the left, e.g., \(\text{rot}_2(<a, b, c, d, e>) = <c, d, e, a, b>\).*

a. First four measures at reh. 16.

Rhythmic series \(A_1 = <\frac{1}{6}, \frac{1}{2}, \frac{1}{2}, \frac{3}{5}, \frac{3}{5}>\)

Durations in the string parts:
- Vln. I: \(A_1\)
- Vln. II: \(\text{rot}_2(A_1)\)
- Viola: \(\text{rot}_3(A_1)\)
- Cello: \(\text{rot}_5(A_1)\)

b. Reh. 16 to the beginning of the second system on p. 22.

Rhythmic series \(A_2 = <A_1, A_1, \frac{1}{2}, \frac{1}{2}>\)

Pitch-class simultaneity-dyad series \(\alpha = <\{1,2\}, \{0,1\}, \{2,4\}, \{1,1\}, \{0,1\}, \{6,e\}, \{t,e\}, \{1,2\}, \{t,1\}, \{e,1\}, \{7,0\}, \{e,1\}, \{e,0\}, \{1,7\}>\)

Durations and pitch-class dyads in the string parts:
- Vln. I: \(A_2; \alpha\)
- Vln. II: \(\text{rot}_2(A_2); \text{rot}_{10}(\alpha)\), except the 10\(^{\text{th}}\) dyad of \(\alpha\), \(\{e,1\}\), is replaced by \(\{1,4\}\)
- Viola: \(\text{rot}_3(A_2); \text{rot}_9(\alpha)\), except the 8\(^{\text{th}}\) dyad of \(\alpha\), \(\{1,2\}\), is replaced by \(\{1,4\}\)
- Cello: \(\text{rot}_5(A_2); \text{rot}_6(\alpha)\)

c. Beginning of the second system on p. 22 to the end of the first system on p. 23.

Rhythmic series \(B = <\frac{1}{4}, \frac{3}{5}, \frac{1}{2}, \frac{3}{7}, \frac{1}{4}, \frac{3}{5}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{2}, \frac{1}{3}, \frac{3}{5}>\)

Pitch-class dyad series \(\beta = <\{8,e\}, \{t,2\}, \{9,0\}, \{t,e\}, \{0,3\}, \{0,1\}, \{0,3\}, \{2,8\}, \{3,3\}, \{2,6\}, \{2,3\}, \{9,2\}, \{0,0\}, \{1,3\}, \{1,2\}>\)

Durations and pitch-class dyads in the string parts:
- Vln. I: \(B; \text{rot}_{10}(\beta)\), except the 12\(^{\text{th}}\) dyad of \(\beta\), \(\{9,2\}\), is replaced by \(\{0,2\}\), the 15\(^{\text{th}}\) dyad of \(\beta\), \(\{1,2\}\), is replaced by \(\{1,3\}\), and the 10\(^{\text{th}}\) dyad of \(\beta\), \(\{2,6\}\), is replaced by \(\{2,8\}\)
- Vln. II: \(\text{rot}_1(B); \beta\)
- Viola: \(\text{rot}_2(B); \text{rot}_{13}(\beta)\), except the 3\(^{\text{rd}}\) dyad of \(\beta\), \(\{9,0\}\), is replaced by \(\{4,9\}\)
- Cello: \(\text{rot}_4(B); \text{rot}_1(\beta)\)

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 lasts from rehearsal 16 to the aligned barlines in the quartet at the beginning of the second system on page 22, such that the final bar of $\frac{4}{6}$ before the aligned barlines in the second violin, viola, and cello parts corresponds to the bar of $\frac{4}{6}$ in the first violin at rehearsal 16. Rotations of a different series account for the string quartet’s rhythms from this alignment on the second system of page 22 to the next conjunction at the end of the first system on page 23. During the first of these two segments, all the parts, including the separate staves of the piano, cycle through the same series of two-note chords (dyadic simultaneities, also presented in Figure 11), but the series of dyads is not coordinated with the rhythmic series. For example, the pitch-class dyads in the second violin part in Example 20 are C and G, followed by C# and B, B and C, and so on. This is the same series of dyads that the cello plays beginning in its fourth bar, but here they occur in a different part of the rhythmic series, with durations of a fifth note in the cello instead of the half note in the second violin, a “three-fifths” note instead of a fifth note, et cetera. A new series of pitch-class dyads takes over at the same time that the rhythmic series changes, the beginning of the second system on page 22. The section thus demonstrates a kind of isorhythmic treatment of rhythm and pitch, in that it is structured around corresponding but independent statements of rhythmic and pitch-class series.

While this structure suggests the section’s notational-compositional variation of the previous metrical organization, a listener is unlikely to track or recognize the relationships among the streams created by the overlaying of rotations of the same series. With the fortissimo dynamics in all parts, I have difficulty even hearing continuity in the viola and cello lines on the commercial recording by the Arditti Quartet with the composer on piano (Adès 2005). Still, some resemblance to the metrical structures in the
Figure 12. Rhythmic reduction of the violins in Example 20 and the following measures.

First Phrase Group

Second Phrase Group

Third Phrase Group
previous three passages does emerge in the combination of onsets from both violin parts if we allow for an even greater amount of flexibility in applying the triple-meter model. Figure 12 shows an interpretation in the same form as Figures 8 and 9 but derived from the violins’ onsets only. The increased flexibility manifests first of all in the greater variety of rhythms that may realize a triple measure, including distortion of the 2:1 long-short ratio like the triple measure consisting of a sixth note, a seventh note, and another sixth note at the very end of Figure 9. When such deviation occurs, as in the second segment of the second phrase group in Figure 12, I have shown a change of time signature within a measure and noted the new ratio of the first two beat classes to the third beat class of the measure. Second, displacements here may begin with an anacrusis that is now either lengthened or shortened with respect to the tempo of the succeeding measure. In addition, onsets that occur in very close succession are counted as a single attack; for example, the respective third onsets in the two violin parts in Example 20 are nearly simultaneous, with the first violin beginning one-thirtieth of a whole note before the second violin, so only one onset appears at this point in the rhythmic reduction of Figure 12. In the final kind of imprecision, durations that are only slightly different from the durations of fifth notes or seventh notes are taken as approximations of those durations. For instance, again in the second segment of the second phrase group, the durations of the would-be half notes in measures of 2/5 and 2/7 are slightly off; in order to match the durations in the figure, their actual durations, 11/30 and 11/42 of a whole note, are altered by one unit in the numerator to 12/30 (=2/5) and 12/42 (=2/7). These further deviations from a durationally exact triple meter can be organized into three sequences consisting of three segments each. The sequences correspond to the three phrase groups delineated by
the durational rotations in Figure 11: the four-bar rotation in Figure 11a, the longer
rotation in Figure 11b (excluding the portion from Figure 11a), and the rotation in Figure
11c.

Figure 12 thus proposes one possibility for continuing to hear the passage at
Example 20 with reference to triple meter. Considering the amount of distortion that this
model incorporates, as well as the concurrent, conflicting rhythmic activity in the rest of
the ensemble, any such sensation of triple meter is likely to be very attenuated at best.
However, especially because of the resemblance with earlier versions of the second
theme, I think a listener will detect cues that suggest the relevance of a triple-meter
schema, if only intermittently. To the extent that this meter remains a context for hearing
the passage, the rhythm can be interpreted not as merely chaotic, but as possessing an
extremely high level of tension, representing a peak of relative tension in the work as a
whole.

Consistent with an intuition that such tension could not be maintained for long,
the section in Example 20 leads to a climax on the homophonic chords at rehearsal 17
that is followed by the much less intense material beginning in Example 21. With its use
of additive time signatures, this passage develops and makes notationally explicit the
departure from the 2:1 long-short ratio that we allowed in Figure 12. Despite differences
in register, Example 21 begins with almost exactly the same chord progression as when
the theme first appeared in Example 17. Figure 13 again interprets the displacements in
the passage, as well as providing the long-short ratios and lengths of each measure in
fractions of a whole note. Since the time signatures effectively define the note values
here, the figure uses time signatures in place of half-note and quarter-note symbols.
Example 21 continued.
Figure 13. Rhythmic reduction of Example 21.

Measure Length: $\frac{25}{48} \quad \frac{19}{42} \quad \frac{11}{28}$

Long-short Ratio: $1 \frac{2}{3} : 1 \quad 1 \frac{5}{7} : 1 \quad 1 \frac{3}{4} : 1$

Stream 1: $\frac{1}{4} \quad \frac{2}{6} \quad \frac{3}{16} \quad \frac{2}{7} \quad \frac{1}{6} \quad \frac{1}{4} \quad \frac{1}{5}$

Stream 2: $\frac{5}{16} \quad \frac{1}{5} \quad \frac{3}{16} \quad \frac{2}{7} \quad \frac{1}{6} \quad \frac{1}{4} \quad \frac{1}{5} \quad \frac{1}{16}$

Stream 3: $\frac{2}{16} \quad \frac{2}{7} \quad \frac{1}{6} \quad \frac{1}{4} \quad \frac{1}{7} \quad \frac{1}{5} \quad \frac{1}{7} \quad \frac{1}{16} \quad \frac{1}{16} \quad \frac{1}{8}$
Figure 14. Measure durations in Example 21.
Brackets labeled $a$ and $b$ point out series of bars that are repeated from one segment to the next. The long-short ratios in each measure vary considerably, but all are less than 2:1, meaning that the long and short durations are closer to being equal than in the rhythmic archetype. The changing ratios in the passage might be heard to play out a gradual return from a ratio of 2:1 to the 3:2 (or 1 $\frac{1}{2}$:1) ratio that first introduced the long-short pattern in Example 16, because the 3:2 ratio occurs twice near the end of the excerpt, and the average long-short ratio in the third segment is almost exactly 3:2. To clarify the relationships among the many fractions of a whole note, Figure 14 graphs the series of measure lengths, excluding the half measures that occur at stream displacements. The three peaks on the graph correspond to the beginnings of the three segments in Figure 13, showing that each segment displays a progressive decrease in measure durations. The passage thus follows the same type of pattern that we interpreted as acceleration in Example 18, now articulated as a more continuous change that occurs both from one measure to the next and over the course of the three segments rather than only in fixed increments of $\frac{3}{5}$, $\frac{3}{6}$, and $\frac{3}{7}$ measures.

In returning to a homorhythmic texture and a clear long-short rhythm, the music in Example 21 is much closer to the triple-meter schema than the preceding passage, and thereby also represents a much more relaxed state in the schema of metaphorical tension. However, the tempo fluctuation is now more pervasive than in the starting, relatively relaxed state of Example 17; indeed, the variable ratios of pairs of long and short durations arguably articulate a tempo change not only from each measure to the next, but also within each measure. This continual deviation from the durations of the metrical schema indicates that the contrametrical tension in Example 21 remains higher than at the
second theme’s starting level, even though we might often associate features in other parameters, such as the pianissimo dynamics, with low tension.

The final excerpt, Example 22, shows the theme that we have been tracking as it appears when it returns in the recapitulation. Here the isochronous $\frac{3}{6}$ meter that underlies the previous examples finally comes to the surface, no longer even attenuated by the disjunct voices in Example 19, so the theme would seem finally to have attained a state of complete metrical relaxation. Yet the passage occurs in the midst of a continual accelerando that spans the recapitulation and increases the tempo to four times its original speed, thereby translating into traditional notation and greatly expanding the accelerandos that were written into the time signatures in the earlier examples. While it is undoubtedly the closest of the examples to the ideal of normative metrical relaxation, then, the recapitulation retains some degree of tension by means of its manic increase in tempo.

The changes in the theme over the course of the Piano Quintet articulate a pattern of metrical allusion with clearly differentiated degrees of relative tension according to the contour $<2\,4\,1\,5\,3\,0>$, as summarized in Table 2. This sequence can support a more detailed and imaginative metaphorical experience than only the comparison of tension. For instance, we could understand the tension already present in the metrical distortion of the first statement of the second theme to be heightened through the expanded repetition of this passage at Example 18. The first two examples lead to a period of respite in the relaxation of Example 19, but the lingering disjunction indicates that the metrical problem has not yet been resolved, and the conflict subsequently escalates to a breaking point with the arrival in the development of Example 20’s many conflicting voices. The energy then recedes in Example 21, but not without deep-seated remnants of the
Table 2. Relative tension in occurrences of the second theme in Thomas Adès, *Piano Quintet.*

<table>
<thead>
<tr>
<th>Example Number</th>
<th>Rehearsal Number</th>
<th>Relative Tension Value</th>
<th>Description of Rhythmic Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>4</td>
<td>2</td>
<td>homophonic distortion and implied disjunction</td>
</tr>
<tr>
<td>18</td>
<td>6-7</td>
<td>4</td>
<td>two disjunct voices added to distortion from Ex. 17</td>
</tr>
<tr>
<td>19</td>
<td>8</td>
<td>1</td>
<td>conventional meter with additional disjunct voices</td>
</tr>
<tr>
<td>20</td>
<td>16</td>
<td>5</td>
<td>intensification of Ex. 18 with systematic disjunction; two most prominent voices interpreted as extensive distortion</td>
</tr>
<tr>
<td>21</td>
<td>after 17</td>
<td>3</td>
<td>homophonic like Ex. 17, but with more pervasive distortion</td>
</tr>
<tr>
<td>22</td>
<td>after 20</td>
<td>0</td>
<td>homophonic conventional meter with extreme accelerando</td>
</tr>
</tbody>
</table>
foregoing violence in the constantly fluctuating departure from the 2:1 long-short ratio. The isochrony in the recapitulation finally brings a relaxation of the overt rhythmic strain, but even though this section has the lowest tension among the six excerpts, the extreme accelerando hints that the intensity of the preceding material has not completely dissipated through its transformation of the theme. Further rhythmic conflict in the movement’s coda (beginning at the Tempo 1 on p. 35 of the score) confirms that a state of true relaxation cannot be attained.

This account promoted by the tension schema resonates with the kind of dramatic trajectory that is often used in interpreting movements in sonata form, indicating that the *Piano Quintet*’s affinity with the character of a sonata runs much more deeply than the simple recurrence of thematic material. At the same time, the metaphorical understanding in terms of tension as opposed to directed motion reflects a difference from the traditional sonata, for whereas the functional harmonic progression that supports the structure of a typical sonata is often understood using a schema of goal-oriented movement, here rhythm expresses the narrative by means of the more static metaphor of tension.
Conclusion

This study has introduced a basic strategy for analyzing rhythm, explained a theoretical perspective that may be used to guide that strategy, and then applied these tools to the analysis of works by two contemporary composers. Building on earlier conceptions of rhythm and meter in terms of multiple streams of onsets, rhythmic-voicing analysis proposes that almost any music implies a texture of several concurrent voices. The strength of this approach is its capacity to accommodate a wide variety of criteria for determining rhythmic voices and relationships among those voices, allowing for the representation of diverse forms of rhythmic organization in the same terms, for the analysis of many different types of music, and for use with numerous different theories of rhythm.

The theoretical perspective developed here supports an account of allusions to conventional meter as they might be understood by a listener. This model of how learned cognitive schemata guide our interpretation of perceptual information facilitates the analysis of rhythm according to both specifically musical and metaphorical patterns. Metrical schemata for recognizing the isochrony and hierarchy in conventional meter also permit listeners to hear many unconventional rhythmic structures in relation to meter, as metrical allusions that fall into the three categories of simple allusion, disjunction, and distortion. On a higher level of schematic interpretation, image schemata acquired through basic physical experiences further organize the changing deviations from metrical schemata according to metaphors such as tension and relaxation. The pairing of rhythmic voicing and schema theory is particularly well suited to analyzing metrical allusion in recent music by the British composers George Benjamin.
and Thomas Adès. In Benjamin’s *Sudden Time*, meter comes to represent time itself, and the second of *Three Inventions for Chamber Orchestra* develops a process of separation and convergence between two main voices. The more fragmented rhythmic structure of Adès’s music often uses metrical allusion in the context of musical references, as in the characteristic, meter-defining ostinatos that contribute to references to the tango genre in *Powder Her Face* and *Arcadiana*, or distortions of triple meter in the second movement of *Asyla* that are not specifically tied to the work’s references. The score of Adès’s *Piano Quintet* employs novel time signatures and misaligned barlines to realize complex metrical distortion and disjunction, following a dramatic pattern of tension and relaxation that participates in the reference to sonata form. Rhythmic voicing and schema theory thus offer the flexibility necessary to provide compelling interpretations of the rich rhythmic phenomena in contemporary music.
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